WIRED

Viruses Are Good for You!

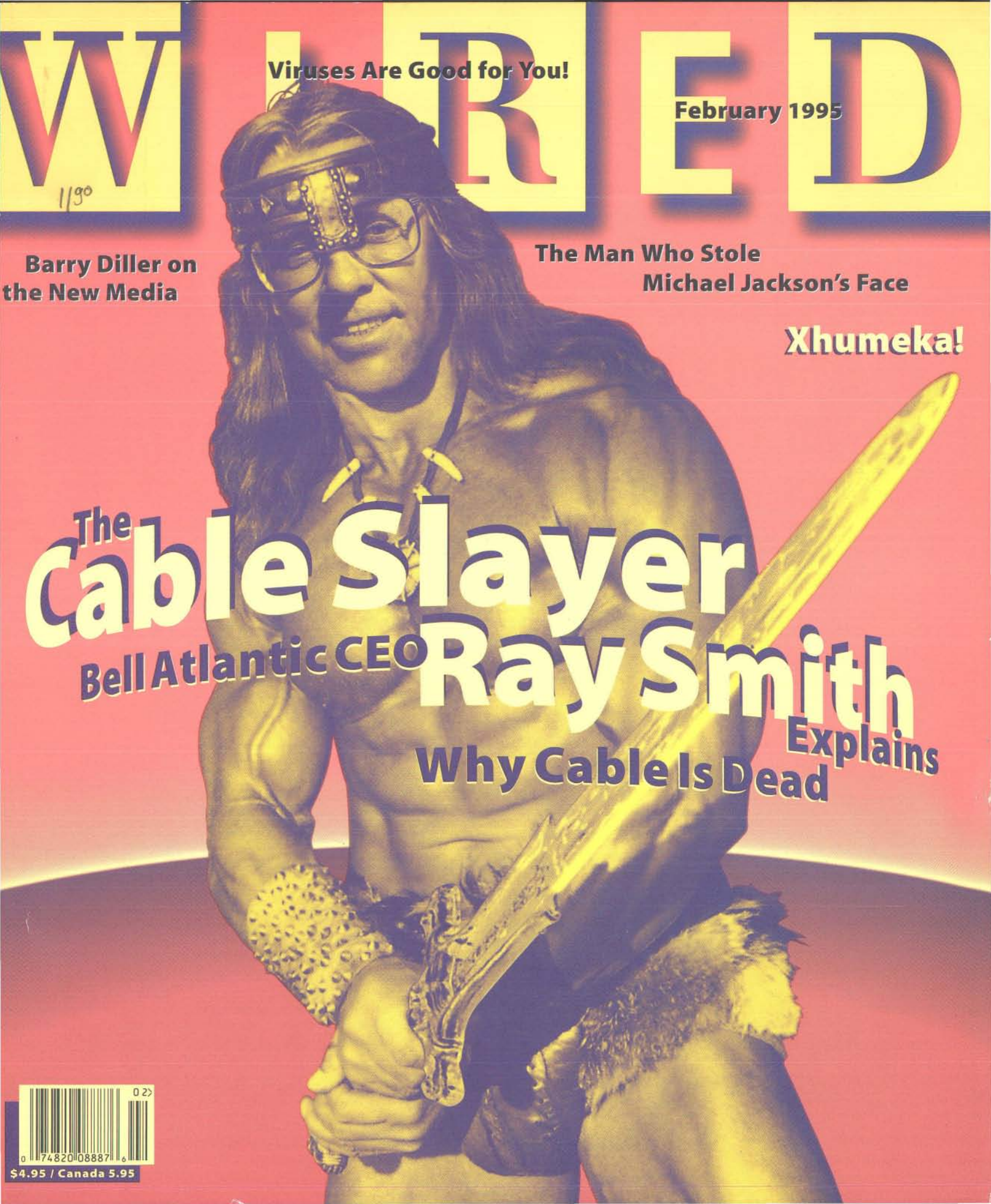
February 1995

1/90

Barry Diller on the New Media

The Man Who Stole Michael Jackson's Face

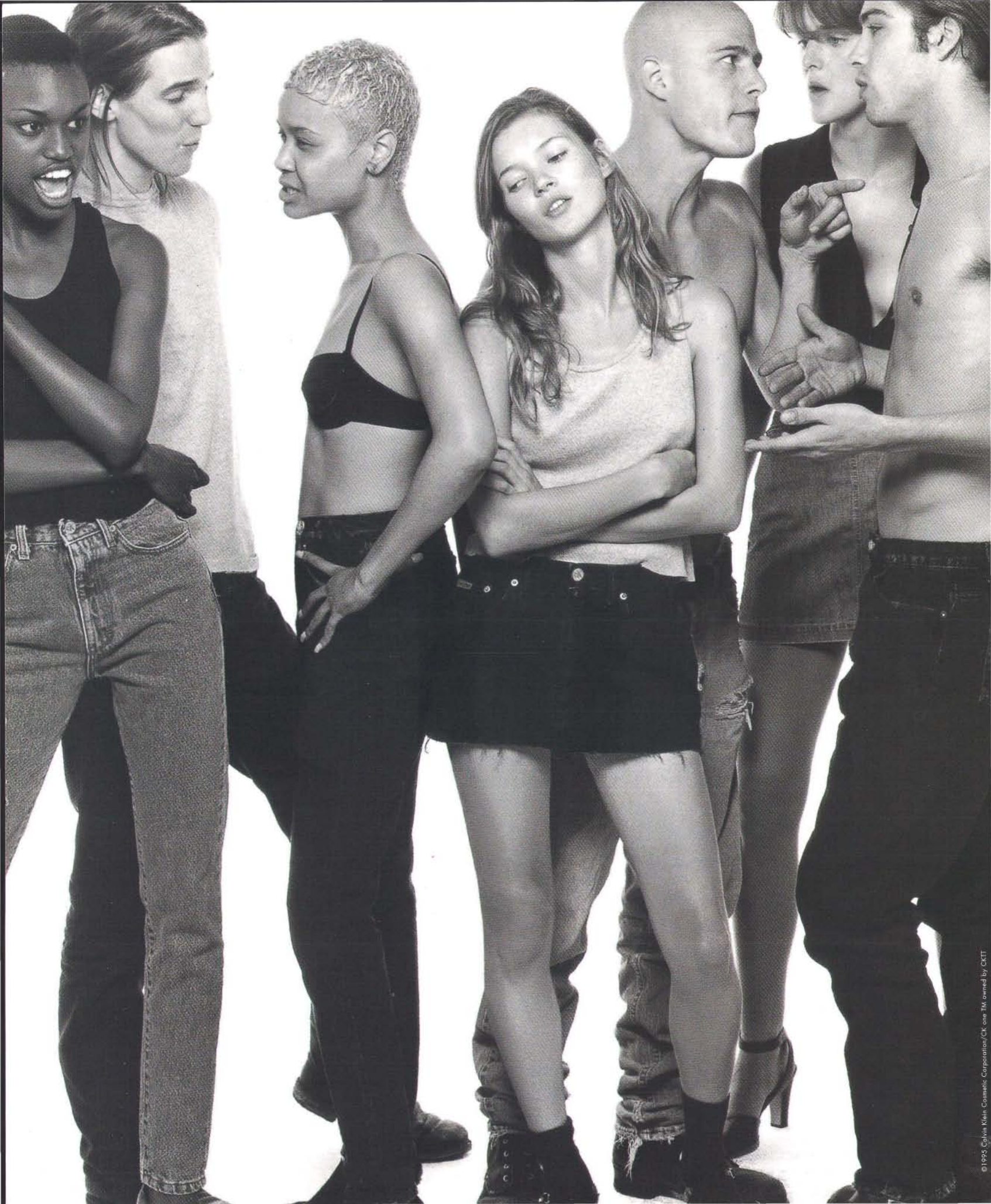
Xhumeka!

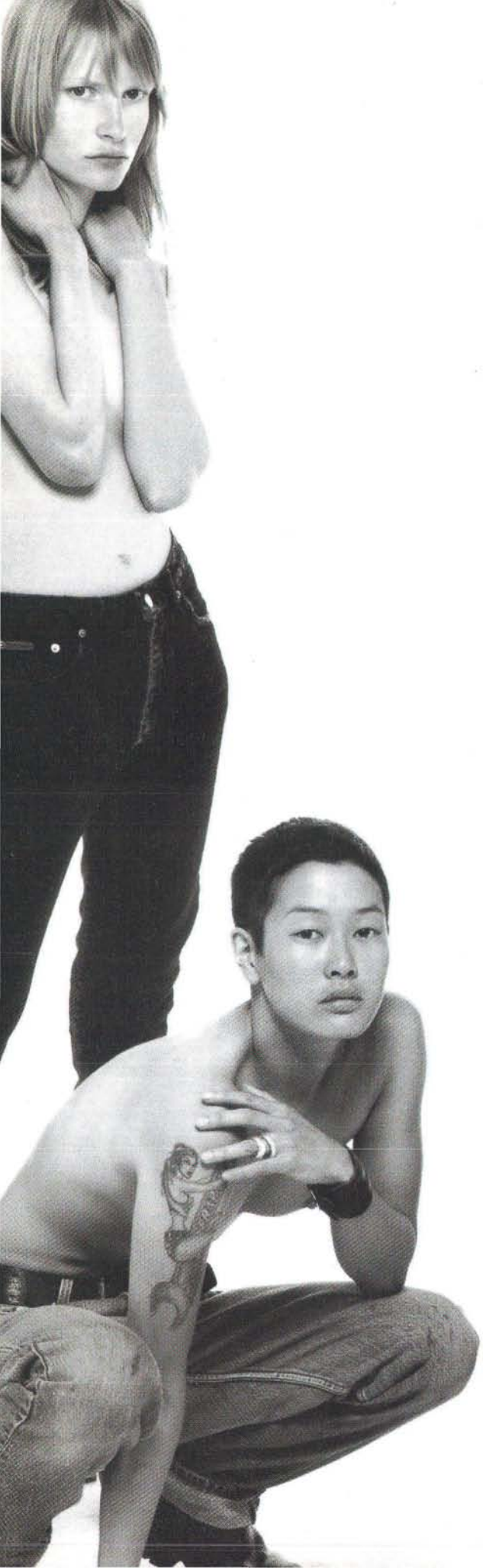


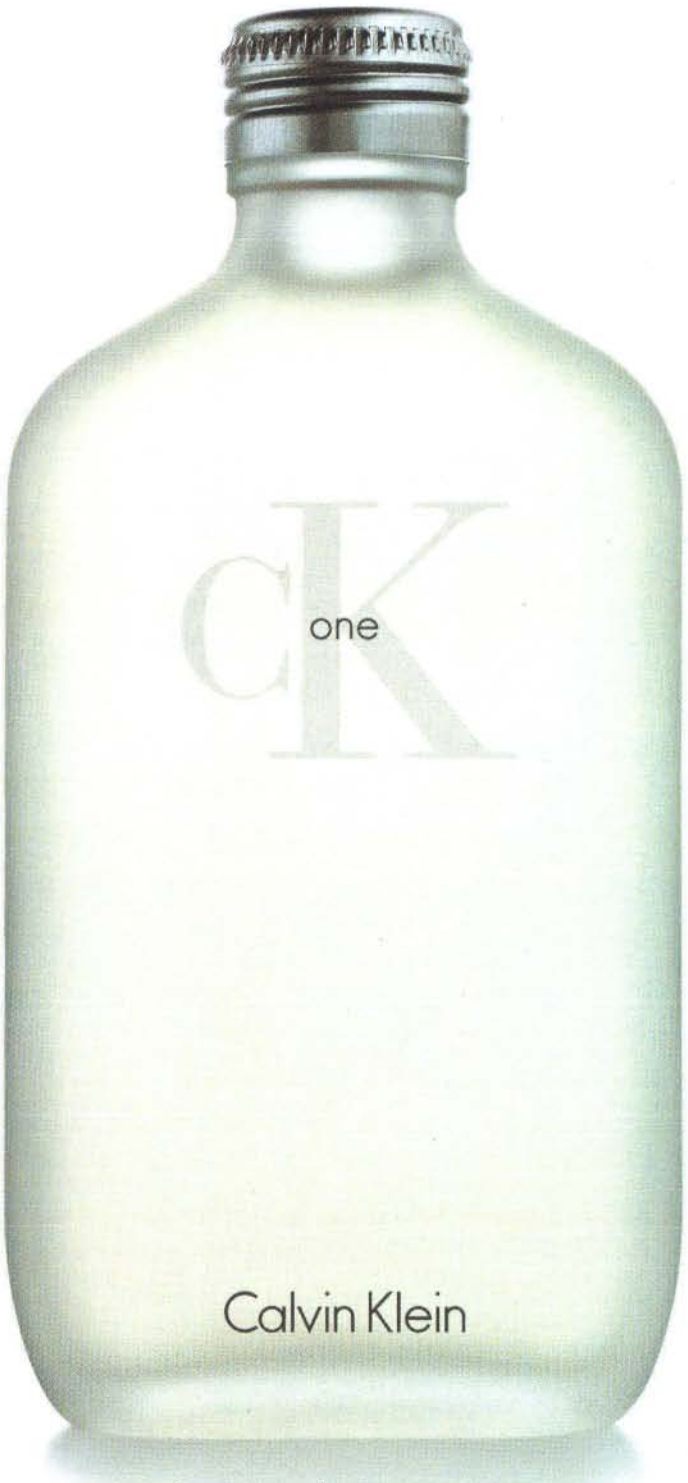
The Cable Slayer

Bell Atlantic CEO Ray Smith Explains Why Cable Is Dead

$4.95 / Canada 5.95


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a new fragrance for a man or a woman

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AN ASTRONOMY STUDENT IN OHIO
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Some people really know how to wake you up. Namely, the engineers here at NEC. Introducing the new Versa™ M, a truly spectacular multimedia notebook computer.

Your multimedia applications will come to life with NEC's first-of-a-kind, photo-quality, 24-bit True Color screen which displays some 16.8 million colors. Or select the first-ever high-resolution 800 x 600 color display, or one of our enhanced TFT or DSTN screens. With each, you get Versa's famous reversible screen.

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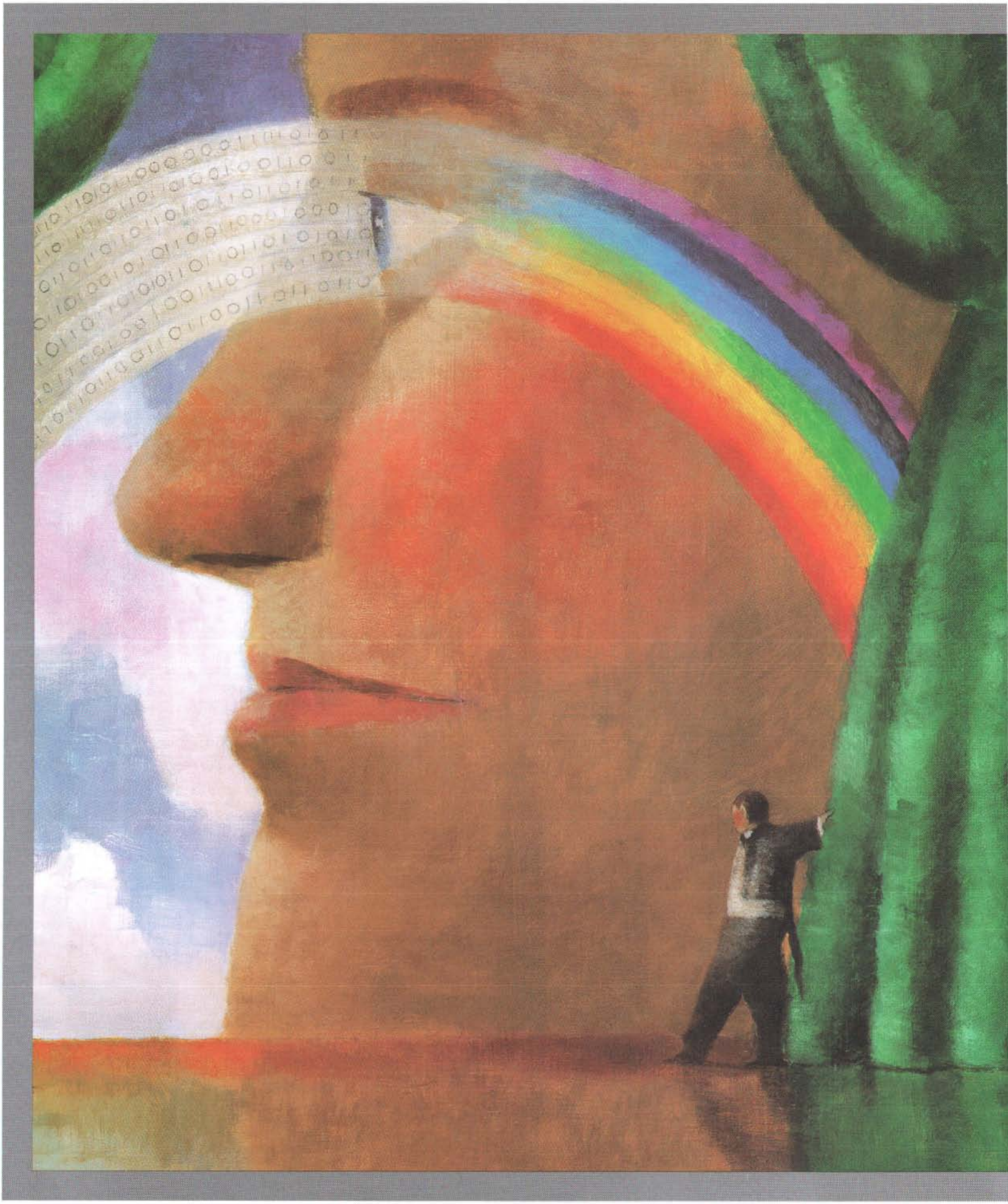
packed. It's powered by an Intel 486 DX/4 75 MHz or 100 MHz processor with 8 MB of RAM, up to 810 MB of hard disk drive storage, and 16-bit high-fidelity sound. It features the innovative VersaBay,™ which is configured with a removable 1.44 MB floppy drive that you can replace with any number of options. Like a PCMCIA Pak, giving you a total of four PCMCIA slots or a Video Pak, through which you can watch television.

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We've all heard a lot of talk about the *Digital Age*. But what have we seen? Here ends the hype, the hyperbole and all those other *"h"* words. Introducing the RCA Digital Satellite System. That's not another announcement. That's a fact. Twenty-two thousand miles above the equator are twin satellites using advanced digital technology to give you the kind of picture and sound that will completely rewrite the television history books.



The 60" RCA Home Theatre and DSS System. Digital Home Theatre is here.

You see, your TV is only as good as the broadcast signal it receives. And the current signal hasn't changed since the NTSC first set the standard way back in 1940. In other words, it's well over 50 years behind the times.

Announcing the end of announcements announcing the coming digital revolution.

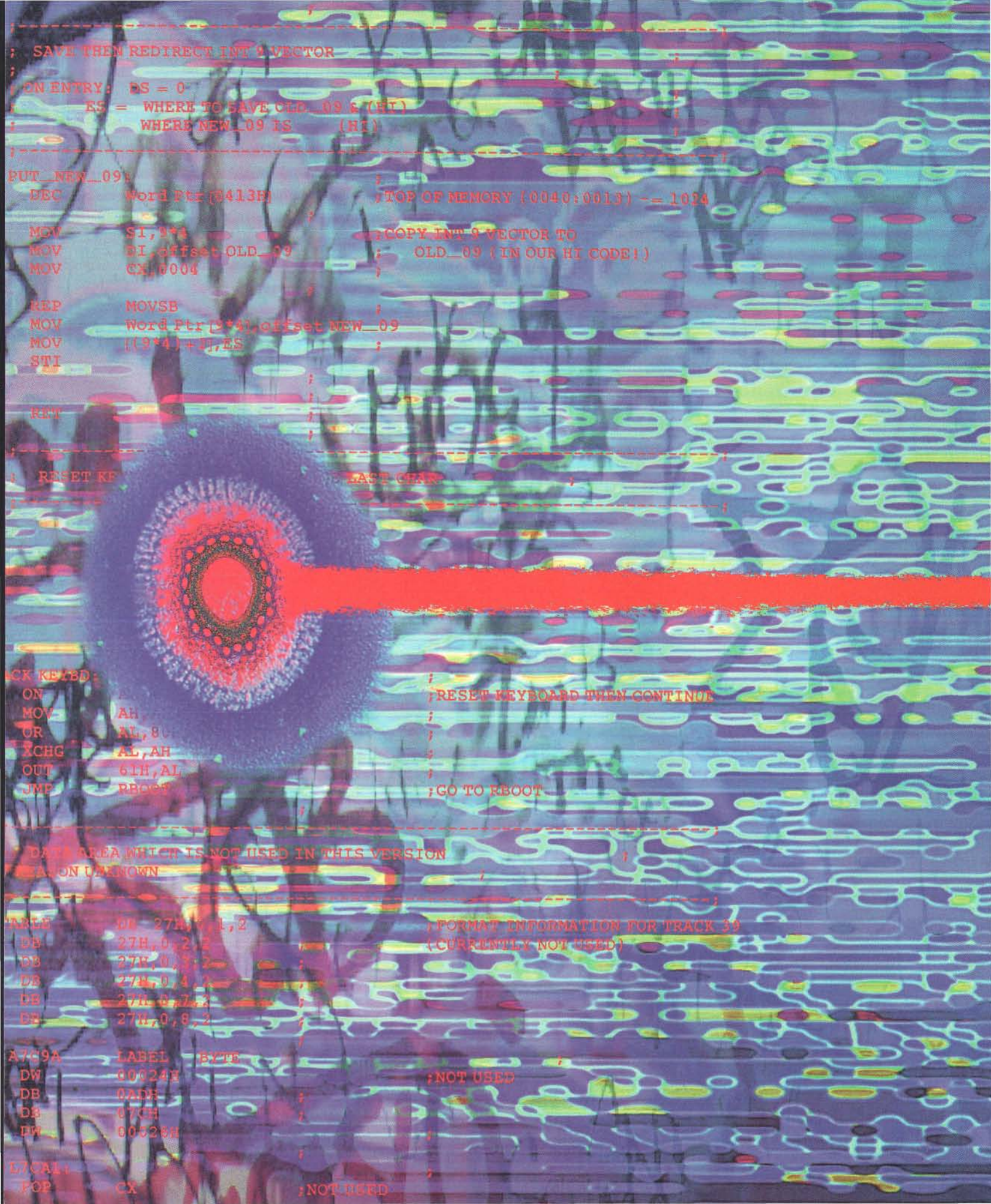
Enter the DSS system. An entirely new kind of broadcast that can deliver up to 35% more lines of resolution and CD-quality sound.* Combine that with an RCA Home Theatre™ and you get *Digital* Home Theatre. Television will never be the same again. The DSS system will be on the cutting edge well into the next century.

It incorporates MPEG-2, the new standard for digital television. It gives you a laser-disc quality* picture and eliminates many of the problems with today's TV and cable systems. Like interference and video noise. You won't get caught with your technological pants down either. The DSS system has a wide-band data port. So when HDTV comes along, you'll be ready.† In fact, we're playing a major role in the development of HDTV. This is not fiction. It's reality. The DSS system could be in your living room tomorrow. So, what are you waiting for? **Changing Entertainment. Again.™** RCA

DSS DIGITAL SATELLITE SYSTEM *An entirely new way of watching television.*



*Picture and sound quality depend on your TV and audio systems. †Additional components required for HDTV. Simulated picture. Screen size measured diagonally.



```
;-----------------------------------------------------------------------;
;  SAVE THEN REDIRECT INT 9 VECTOR                                      ;
;                                                                       ;
; ON ENTRY:  DS = 0                                                     ;
;            ES =  WHERE TO SAVE OLD_09 & (HI)                          ;
;            WHERE NEW_09 IS     (HI)                                   ;
;-----------------------------------------------------------------------;

PUT_NEW_09:                             ;
  DEC     Word Ptr [0413H]              ;TOP OF MEMORY (0040:0013) -= 1024

  MOV     SI,9*4                        ;COPY INT 9 VECTOR TO
  MOV     DI,offset OLD_09              ;   OLD_09 (IN OUR HI CODE!)
  MOV     CX,0004                       ;

  REP     MOVSB                         ;
  MOV     Word Ptr [9*4],offset NEW_09
  MOV     [(9*4)+2],ES                  ;
  STI

  RET

;-----------------------------------------------------------------------;
;  RESET KE                    LAST CHAR                                ;
;-----------------------------------------------------------------------;

CK KEYBD:                               ;
  ON                                    ;RESET KEYBOARD THEN CONTINUE
  MOV     AH                            ;
  OR      AL,8                          ;
  XCHG    AL,AH                         ;
  OUT     61H,AL                        ;
  JMP     RBOOT                         ;GO TO RBOOT

;-----------------------------------------------------------------------;
;  DATA AREA WHICH IS NOT USED IN THIS VERSION                          ;
;  ALSO UNKNOWN                                                         ;
;-----------------------------------------------------------------------;

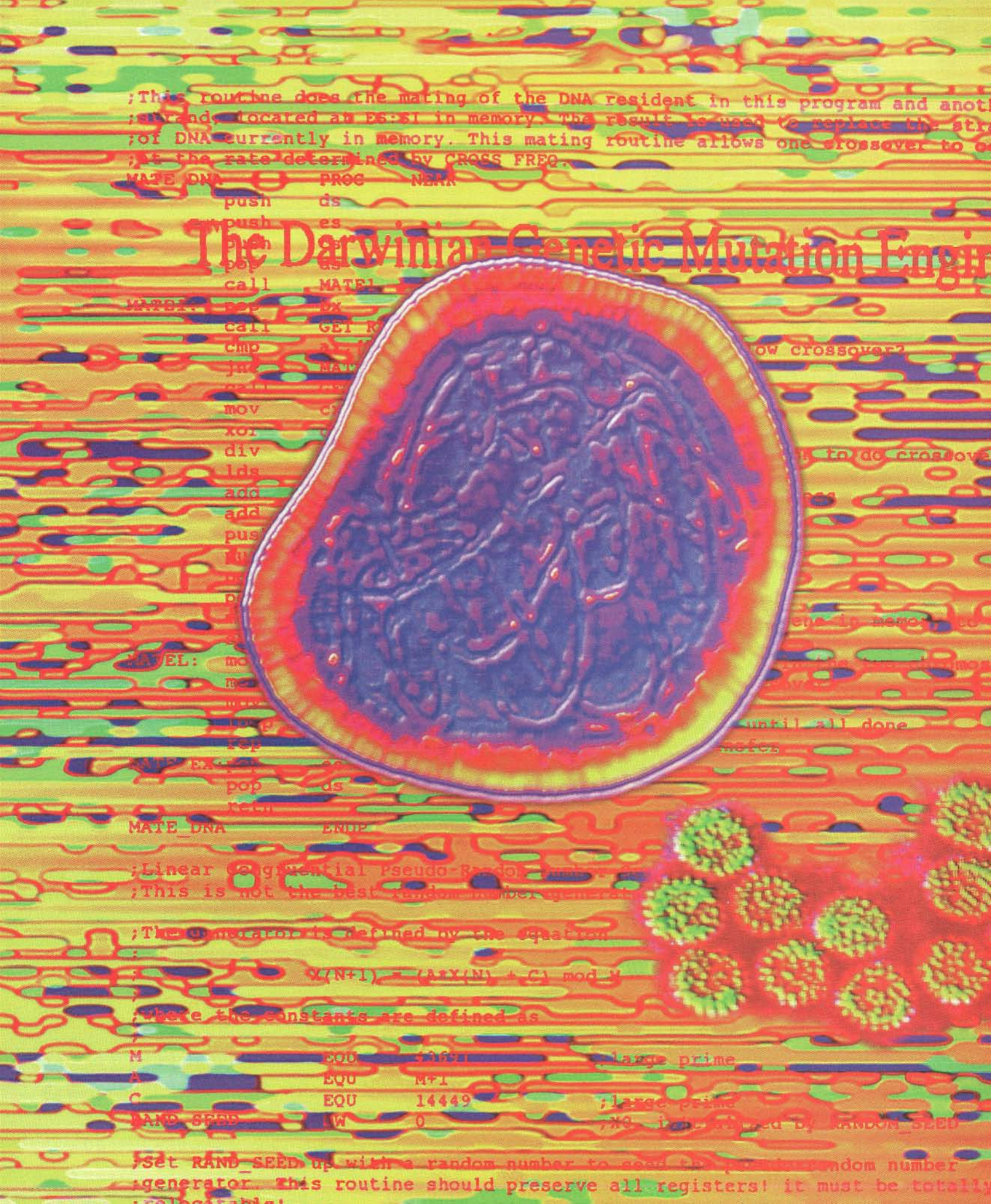
ABLE    DB   27H,7,1,2                  ;FORMAT INFORMATION FOR TRACK 39
  DB    27H,0,2,2                       ;(CURRENTLY NOT USED)
  DB    27H,0,3,2                       ;
  DB    27H,0,4,2                       ;
  DB    27H,0,7,2                       ;
  DB    27H,0,8,2                       ;

A7C9A   LABEL   BYTE                    ;
  DW    00024H                          ;NOT USED
  DB    0ADH                            ;
  DB    07CH                            ;
  DW    00020H                          ;

L7CA1:                                  ;
  POP     CX                            ;NOT USED
```


Every virus
turned out into
the computer
wilds is also a
carrier for the
purest and
strongest
signal a human
being can send.


"Remember
my name,"
the virus says,
which after all
is just another
way of saying,
"I'm alive."
-Julian Dibbell, page 126


The Darwinian Genetic Mutation Engi
;This routine does the mating of the DNA resident in this program and anoth
;strand, located at DS:SI in memory. The result is used to replace th: str
;of DNA currently in memory. This mating routine allows one crossover to o
;at the rate determined by CROSS_FREQ.
MATE_DNA PROC NEAR
push ds
push es
call MATE1
MATE1: pop dx
call GET_R
cmp
jne
call
mov
xor
div
lds
add
add
pus
MOVEL:
rep
pop ds
retn
MATE_DNA ENDP
;Linear Congruential Pseudo-Random
;This is not the best
;The Generator is defined by the equation
;
; X(N+1) = (A*X(N) + C) mod M
;
;where the constants are defined as
;
M EQU
A EQU M+1
C EQU 14449
RAND_SEED DW 0
;Set RAND_SEED up with a random number to seed the
;generator. This routine should preserve all registers! it must be totall
until all done

Context

30 **Rants & Raves** Reader feedback

41 **Electric Word** Bulletins from the front line of the Digital Revolution

51 **Scans** People, companies, and ideas that matter

59 **Fetish** Techno-lust

64 **Reality Check** Video-on-Demand

66 **Raw Data** Stats 'R' Us

68 **Geek Page** Stochastic Screening

72 **Cyber Rights Now** By Mike Godwin

108 **Follow the Money** Introducing the *Wired* interactive technology fund



ELECTROSPHERE

74 **beverly_hills.com** By Paulina Borsook and Andy Reinhardt

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86 **With Psychic Friends Like These, Who Needs Enemies?** By Rogier van Bakel

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Align and Conquer
The smartest telco CEO, Bell Atlantic's Ray Smith, reveals what really torpedoed his merger with John Malone's TCI, why the telcos are going to kick cable's butts, and precisely how the I-way is going to reach your home. By David Kline

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Modem Grrrl
Future hacker St. Jude has some advice for women who see technology as a problem: get modems. By Rosie Cross

120 

The Last Human Chess Master
First, humans found out the world was round. Then they discovered that they were like the rest of the animals. Now they're about to suffer the ultimate humiliation: Their vaunted brains are no match for a machine. By Jeffrey Goldsmith

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Viruses Are Good for You
Spawn of the devil, computer viruses may help us realize the full potential of the Net. By Julian Dibbell

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Fuzzy Thinker
Fuzzy logic guru Bart Kosko explains Spock's worst nightmare.
By Sheldon Teitelbaum

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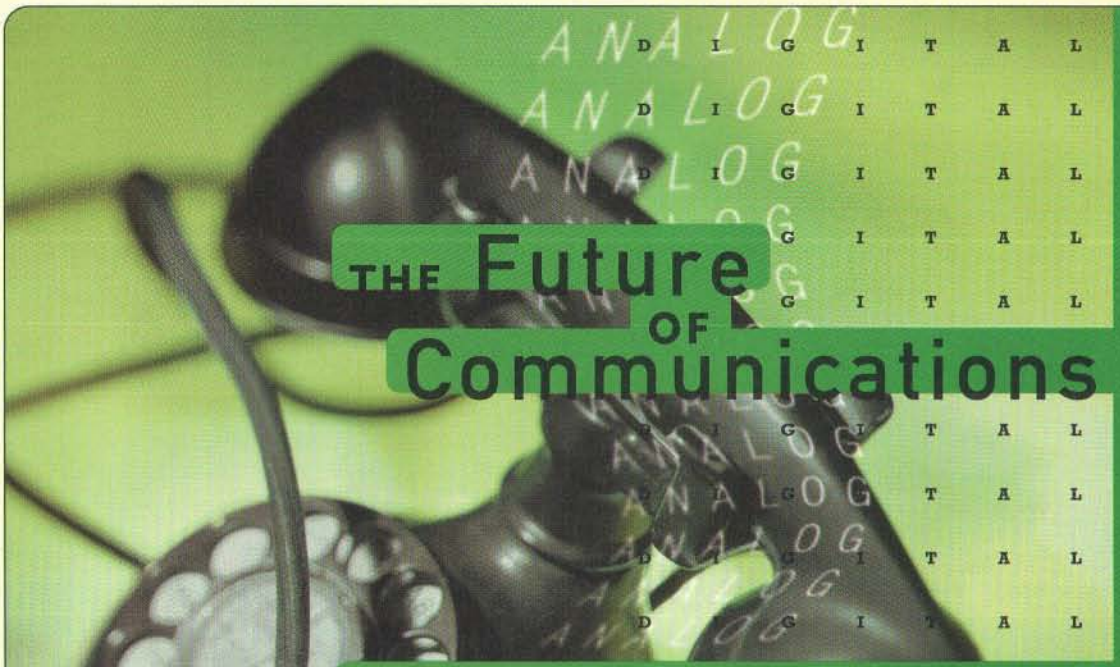
The Man Who Stole Michael Jackson's Face
John Oswald creates new works from existing sonic materials. His *Plunderphonic* CD got him in trouble with the copyright police. It also got him gigs with the Kronos Quartet and the Grateful Dead. By David Gans



94 **Envisioning the Impossible** By Kevin Kelly

124 **Don't Panic!** By Tricia McGillis

Cover Illustration: Ray Smith photo by Neil Selkirk, *Conan the Barbarian* from Motion Picture and Television Archive
Zulu translation courtesy of International Contact, Inc.
Introduction: Johan Vipper



THE Future OF Communications

Fig. 1.



VOICE, DATA, VIDEO. We can literally put all the information in the world on your desk. Or in your laptop. Because we can convert every voice, data, or video message into pure digital form, and send it to you as an e-mail, high-speed data, in video-conference, or through **ISDN** which combines all the above.

Let's say you want all the benefits of the information age. You'd need a 100% digital network. Which would let you connect every communications tool at the simple, elegant level of **ones and zeros**.

So at Sprint, we built exactly that kind of network for you. From the ground up. And from the beginning, we had only one goal. To create a single platform that would give you total **connectivity**. Unlimited capacity. And allow you to use every conceivable new technology, in any combination you could dream up.

100% DIGITAL.

Obviously, this new network had to have huge bandwidth. Beady-eyed accuracy. And **open architecture**. So that every time we saw an opportunity for improvement, we could just upgrade the software. Instead of rebuilding the whole system.

So we laid 23,000 miles of 100% digital, **fiber optic cable**. Compared to old-time, lumpy long distance networks, it was a masterpiece of simplicity. No old baggage, no retro-tech. The whole system was pure digital from the get-go.

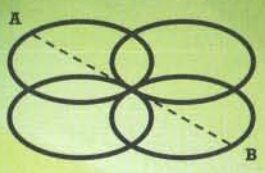
And today, we're adding high-end features like ATM (Asynchronous Transfer Mode), which lets us transmit voice, data, and video images over one line, at eyeball-flattening speeds. Up to 45 megabytes per second.

These days, it seems like the whole world is talking about connectivity.

Well, this is connectivity in its purest form. The world's first **future-friendly** network. And you can have it right now.

It's that simple.

Fig. 2.



SONET (Synchronous Optical Network). Our version of SONET isn't just the fastest, it's also the safest. Instead of point-to-point linear systems, it has 4 bidirectional line-switched fiber rings. So even some guy with a backhoe can't stop the relentless flow of data between Point **A** and Point **B**.

Toll Free 1-800-PIN-DROP **http://www.sprintlink.net/**



1000% SIMPLER.

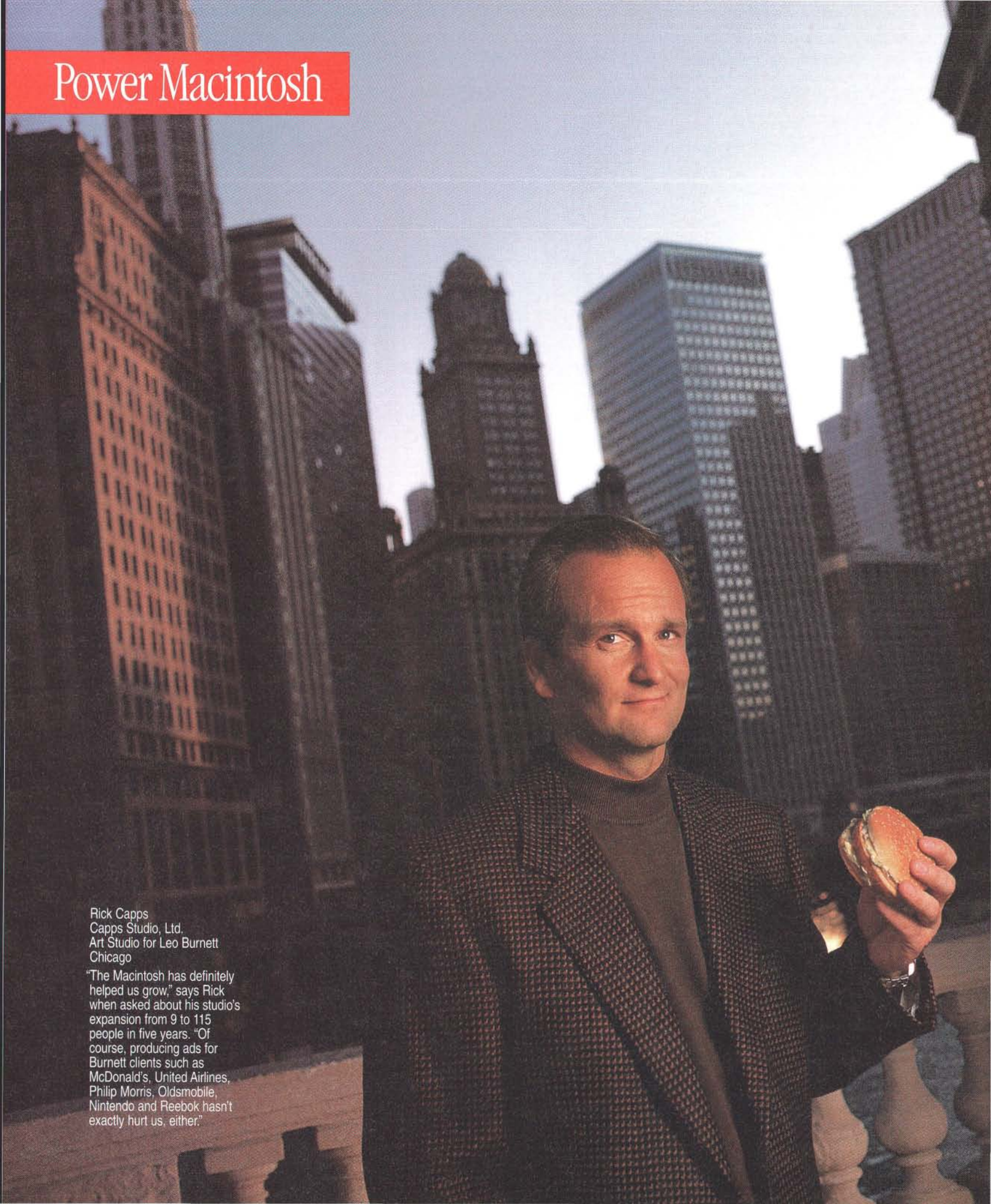
Today you can get information from phones, computers, faxes, and video images. And from the beginning, our network was built to connect all of them.
It's that simple.



Sprint®
Be there now.

©1995 Sprint Communications Company L.P.

Power Macintosh



Rick Capps
Capps Studio, Ltd.
Art Studio for Leo Burnett
Chicago

"The Macintosh has definitely helped us grow," says Rick when asked about his studio's expansion from 9 to 115 people in five years. "Of course, producing ads for Burnett clients such as McDonald's, United Airlines, Philip Morris, Oldsmobile, Nintendo and Reebok hasn't exactly hurt us, either."

"We can literally take a concept on a napkin and



"Because Power Macintosh is so fast and can push huge files around, we can use it to replace many of the functions of much more expensive, dedicated color correction systems."

go all the way to color-corrected digital files and proofs out the door. All on Power Macintosh. All in-house. That not only saves time and increases productivity, it also gives us total control, start to finish. There's just one problem. Deciding



Powered by the RISC-based PowerPC microprocessor, Power Macintosh runs accelerated versions of popular publishing and imaging software at two to six times the speed of non-native versions while providing complete compatibility with existing Macintosh applications.



"Creating big ideas–that's the creatives' job. In the studio, it's our job to turn those ideas into ads, as fast as humanly possible."

if the mustard stain is part of the concept. Or part of someone's lunch."

Power Macintosh. The business Macintosh. Apple

in addition to typesetting and final mechanical assembly, on one desktop system.

"Our first tests show the Power Macintosh taking a little longer than the Scitex Blaze to accomplish the same tasks. But when you consider that the Mac costs one-tenth as much, ultimately you're getting an awful lot of power for the money."

"We helped United boost on-time arrivals."

Using Power Macintosh for color correction, retouching and production is just the start for Capps Studio. To help United Airlines fight the fare wars, Capps uses DDPA (Digital Distribution of Print Advertising) to take a day out of the production cycle, sending new ad materials directly in electronic form to the New York *Daily News*, *USA Today* and other regional and national newspapers.



At Capps, Power Macintosh computers do a lot more than layouts and type. Depending on the client and job, they may also be used for illustration, retouching, photocomposition, even final color correction.

To help the creatives at Leo Burnett take advantage of new technologies, the studio has created Resource Centers complete with printers, scanners, Power Macintosh 7100 systems, even on-staff trainers.

And to speed up the approval process for Burnett clients around the world, Capps is establishing a remote electronic approval system based on Adobe Acrobat and Power Macintosh. This allows everyone involved in a project—agency, client and studio—to review advertising materials simultaneously, communicating by phone or by on-screen annotations.



FREE INFORMATION!

To learn even more about Power Macintosh, call 800-510-6023 today. We'll fax you product specs, details on upgrades, a list of optimized applications and benchmark comparisons. Or, if you prefer info by mail, call us at 800-732-3131, ext. 725, today.



"A Power Macintosh on every desk."

"Things are definitely changing," Rick concludes. "The difference between high-end imaging systems and Macintosh technology is quickly disappearing. We're experimenting right now with true desk-to-desk videoconferencing. Soon, we'll begin an aggressive push into multimedia. How will we make it all happen? To start with, we'll put a Power Macintosh on every artist's desk."

To put a Power Macintosh on your desk, call 800-732-3131, ext. 725, today. Ask us for more information. Or ask for the name of your nearest authorized Apple reseller. And see for yourself what kind of power Rick Capps is really talking about. That's right. The power to be your best.®

Apple

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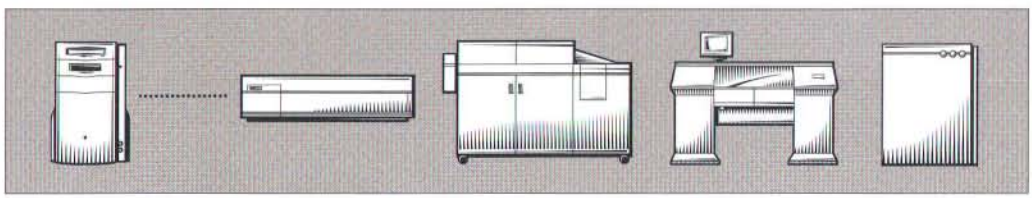
Rick Capps and the folks at Capps Studio may spend a little extra time figuring out what role a mustard stain on a napkin plays in the next new ad for McDonald's.®

But they don't waste much time figuring out how to make Power Macintosh™ work to their advantage.

Maybe that's because they have so little time to waste. After all, it's not every production studio that opens more than 10,000 jobs a year, producing award-winning ads for the $4.3 billion agency headquartered on 30 floors on Chicago's West Wacker Drive. (Yes, Leo Burnett.) And it's not every studio that grows from 9 to 115 people in five short years. While maintaining a dedication to quality that dates back to 1951, the year Rick's father first opened Capps' doors.



Add the peripherals of your choice to a Power Macintosh, plus accelerated versions of popular software, and you can build your own custom publishing solution. Shown here is a Power Macintosh 8100 with a 20" Apple® Multiple Scan Display, Apple LaserWriter® 16/600 PS and a QuickTake™ 100 digital camera.



Capps does a lot with the Power Macintosh, but not everything. When the need arises, artists ship mammoth files to the Scitex Blaze II for final color tweaks or to the Kodak color proofing system for color-on-paper checks. In fact, all Power Macintosh systems are tied into the DEC™ VAX™ server, and to Burnett's bevy of DOS and Windows machines, too.

"Power Macintosh makes us tough to beat."

Ask Rick about the secret behind his success, and you'll hear everything from "My dad taught me that if you help make the creatives look good, you'll do well" to "Obviously, kerning is everything in this business" and "To do great work, you need great people."

He'll also tell you how Power Macintosh is reshaping his business. By accelerating the demise of traditional production techniques. By pushing into the high-end arena of color correction. By increasing productivity. Reducing costs. And more.

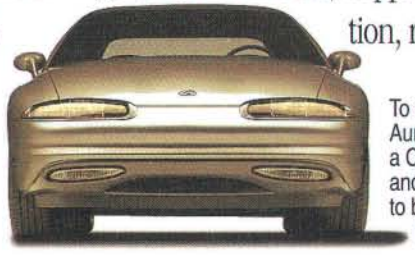
At the most basic level, Capps uses Power Macintosh 8100 systems for comping, keylining, typesetting and final ad assembly—much the same tasks Macintosh® systems have always been used for. Except that with the RISC-based PowerPC™ microprocessor at the heart of every Power Macintosh, those tasks can be accomplished much faster. Especially with new, accelerated software such as Adobe™ Illustrator, Aldus FreeHand, Adobe Photoshop and QuarkXPress—they run two to six times faster than non-native versions. "It's so much faster," Rick says. "We really were amazed."

"It rivals a Scitex."

Producing mechanicals on a Mac™ is one thing. Going all the way on a Power Mac™ to color-corrected digital files for film output is another. Yet that's exactly what Capps is doing on a new Power Macintosh 8100.

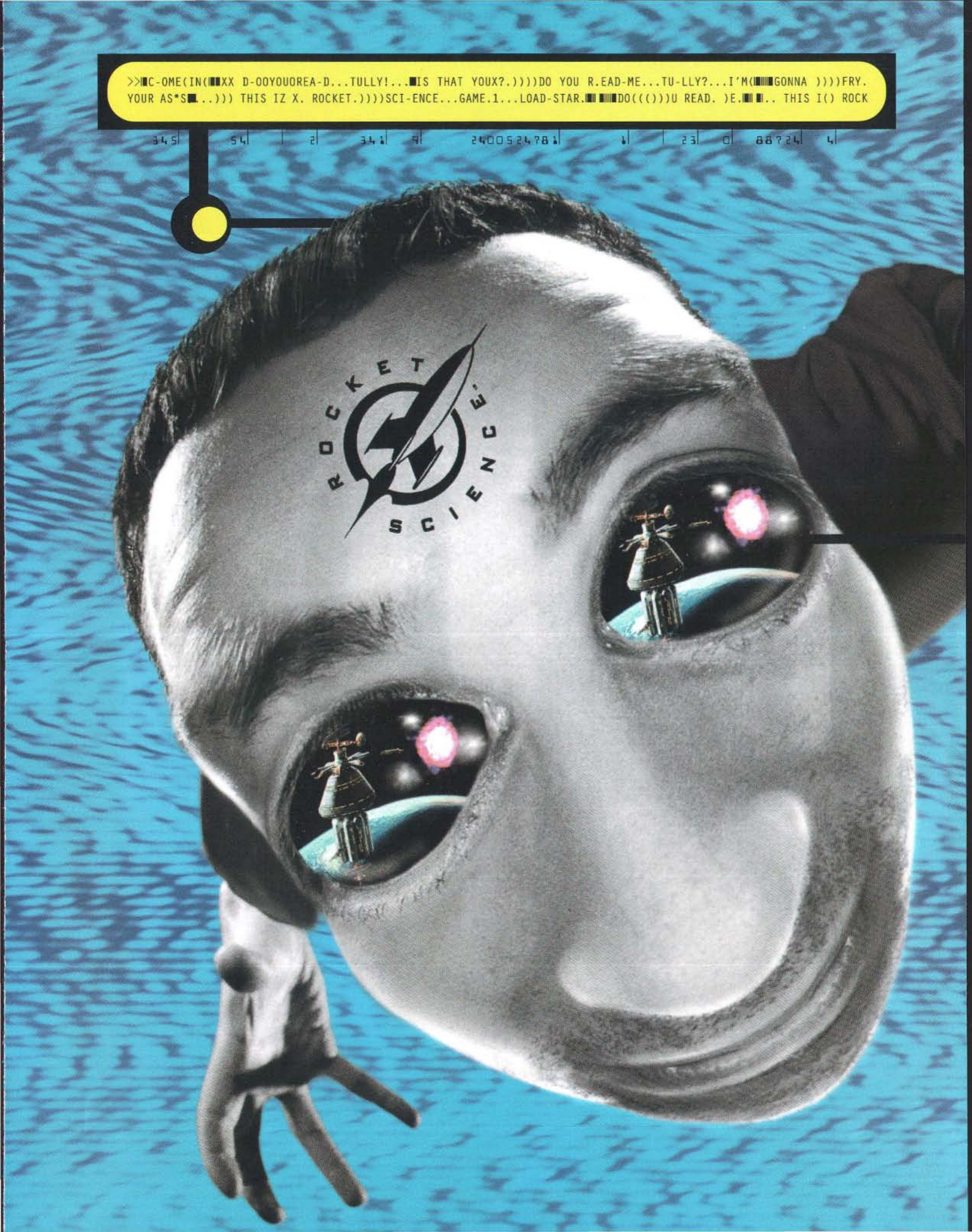
A little perspective may be useful here. With two Isomet drum scanners, two Agfa Imagesetters, a Kodak Approval digital proofing system, three Shima Seiki SGX systems and three Scitex workstations, Capps is no stranger to "doing it all" in-house.

But, as Rick puts it, "Until Power Macintosh, desktop PCs just couldn't pull it all together. We've always had to use specialized standalone systems too." Now, using Photoshop 3.0 on a Power Mac, Capps artists can do photocomposition, retouching and color correction,

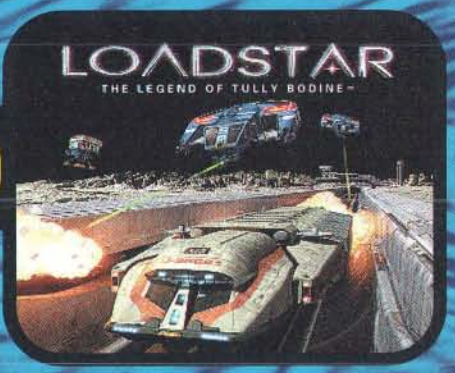


To support the launch of Oldsmobile's new Aurora luxury sedan, Capps Studio produced a CD-ROM containing all the materials dealers and their advertising agencies might need to build co-op ads. Next up is a CD-ROM for the entire Oldsmobile line.

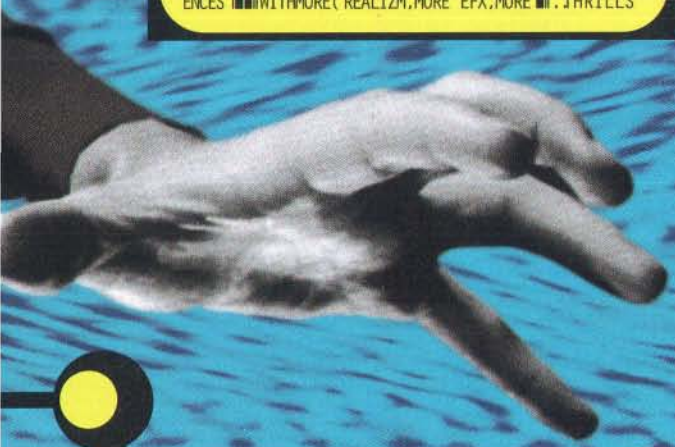
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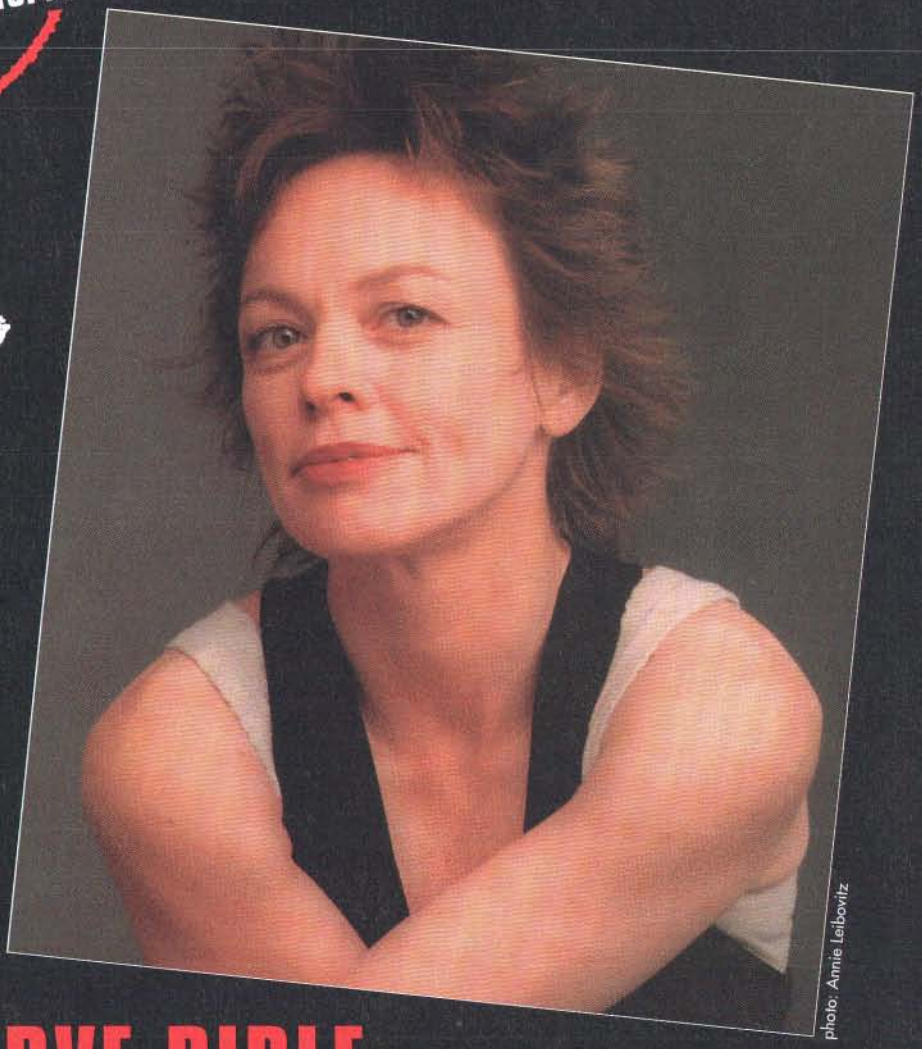
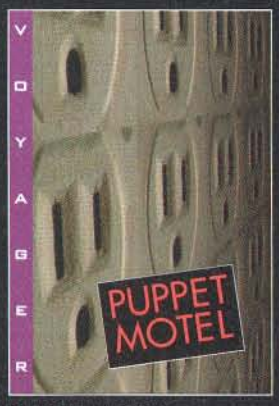


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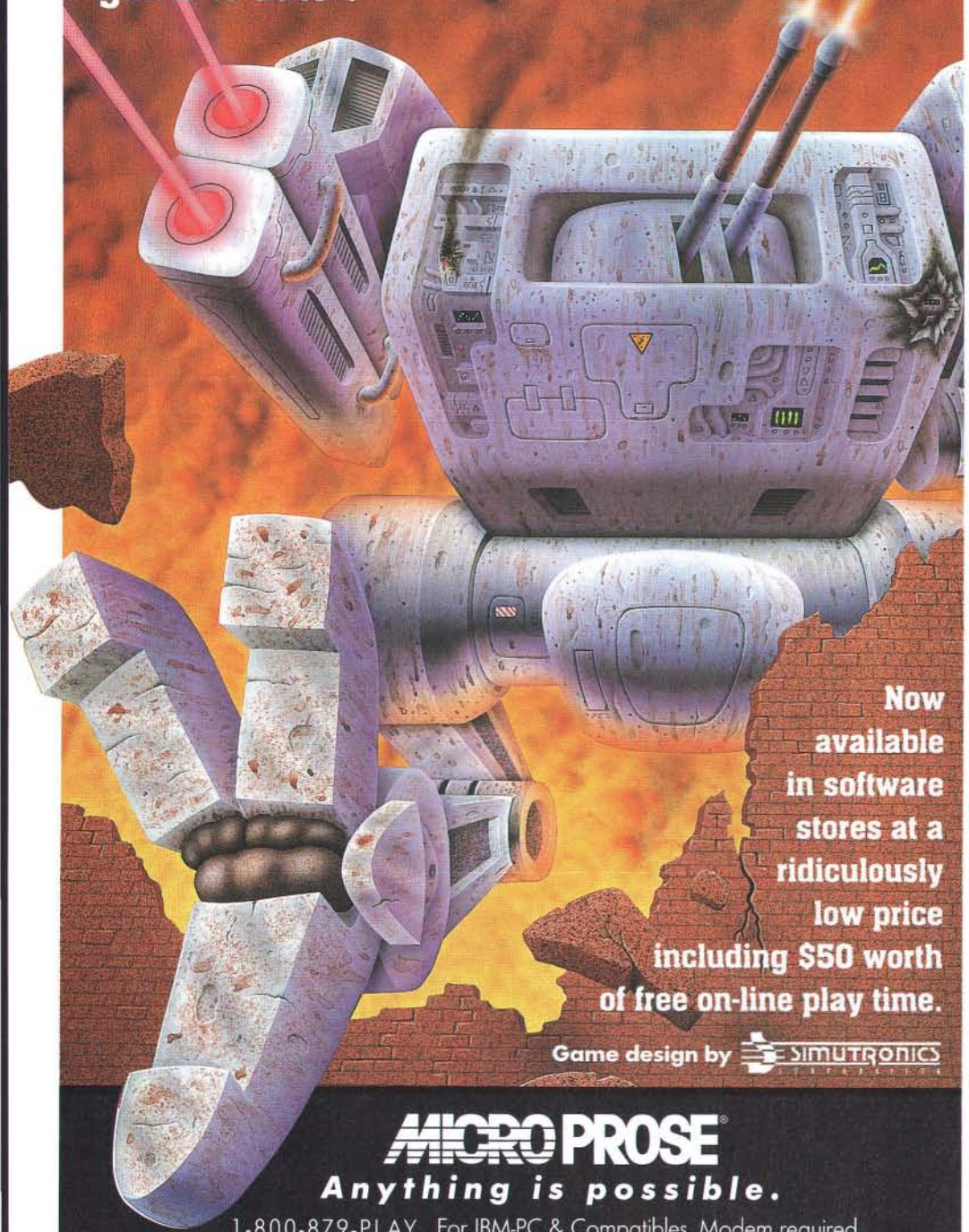
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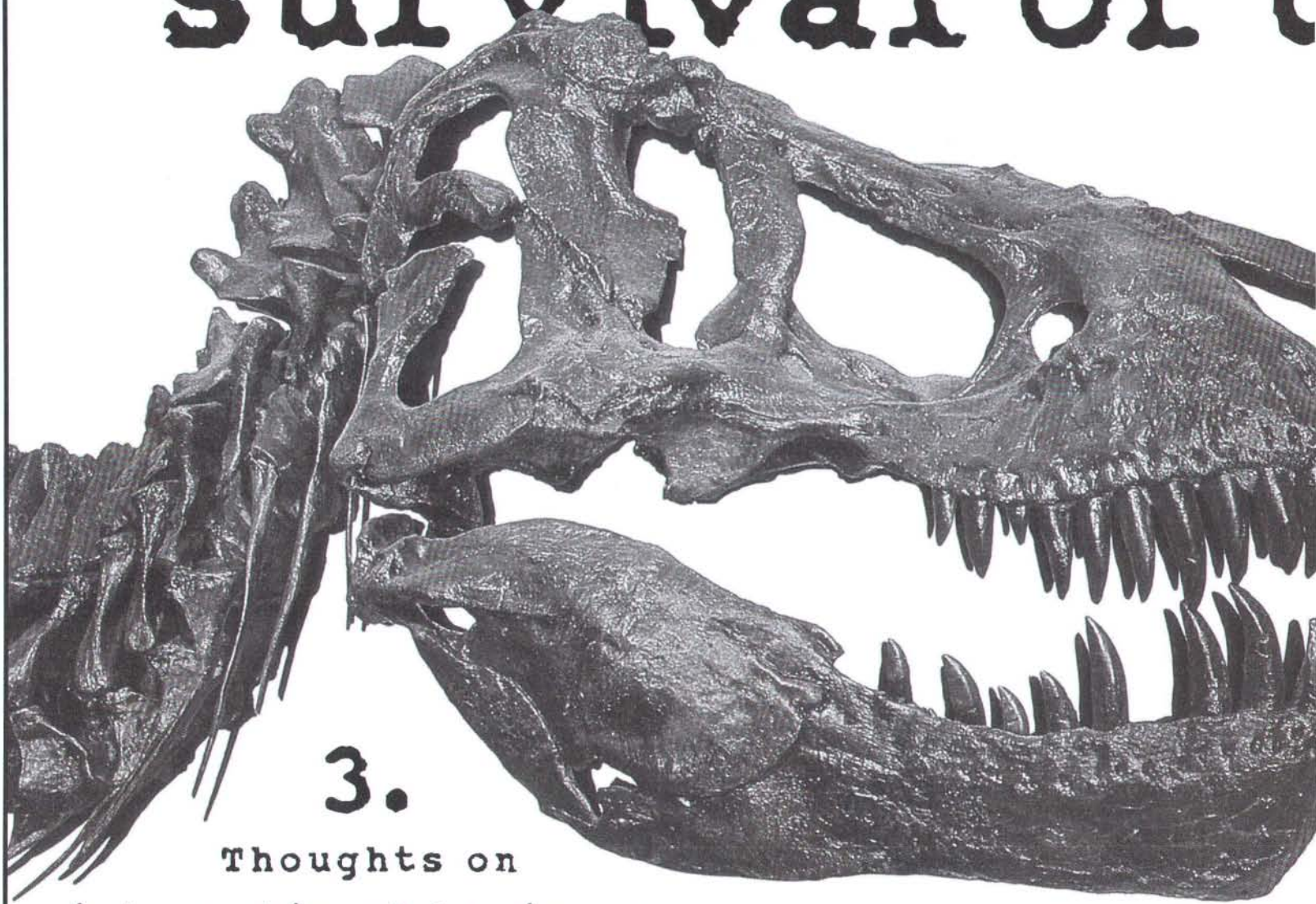
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3.

Thoughts on international business.

Charles Darwin is not to blame. His theory was not about the survival of the biggest, but of the fittest. About the ability to adapt.

Yet in business life evolution has commonly been simplified to growth and size, up to a level where giants stumbled. Since then we have come to realize that for companies too, the future lies in their ability to fit into

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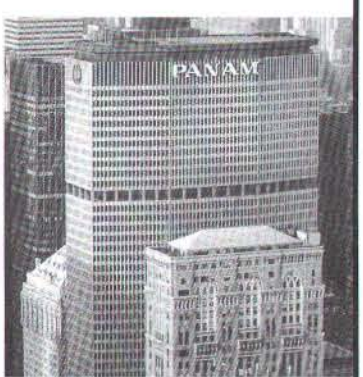
an ever-changing society. Where flexibility is becoming more important than size. And the power of control is beaten by the strength of creativity. This calls for inspiration and motivation rather than domination, and thus for new ways of working together. A need also reflected by the power shift in automation, where centralized thinking is rapidly being replaced by the need for integrated flexibility.



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Rants & Raves

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Desensitization ... or Catharsis?

Congratulations to *Wired* on "Game Ratings," the article on the Senate videogame rating scheme (*Wired* 2.11, page 120). The picture on page 123, depicting Bambi being approached by a masked, male figure as she sits, chained to the bed, should have been rated Level 4, and could be considered "obscene" under some state laws.

I submit that a female deer Moreau (to borrow S. Andrew Swann's terminology), naked, chained, and about to be subject to the attentions of the masked figure, would be closer to Level 4 than the relatively innocuous Level 2 it was designed to illustrate. I would most definitely feel that way if the scene appeared in a videogame that I was considering for my 7-year-old son (or even my 19-year-old daughter). I agree that the right to free speech should cover the designers, manufacturers, and resellers of the games, but let's at least give the parents a chance to help their kids make reasonable choices. If we do nothing, we run the risk of the Ultra Liberal Know-It-Alls and the Ultra Conservative Bluenoses banding together to shove something even worse down our collective throats!

Keep up the good work, and keep us informed on these matters.

Charles Krin
ckrin@delphi.com



While Rogier van Bakel believes he has found the core objection to a videogame rating system – namely that it is logically indistinguishable from a rating system imposed on books – there are at least four reasons why we should not see recent congressional overtures as an apocalyptic assault on our liberty. I mention these arguments despite the fact that I, like van Bakel, oppose such a rating system.

There's a big difference between freedom of speech and freedom of expression. The latter – such as wearing a shirt that reads "Fuck you" – has never been given the same level of protection by the Supreme Court as the former. I think you could make a strong case that the content of videogames falls into the latter category.

Videogames ain't books. We can argue about whether videogames have editorial content worthy of protection under the First Amendment, but you can't possibly consider videogames to be as central to our notion of free speech as books.

Which leads to my third point: slippery-slope arguments are inherently suspect. Just as I dismiss the NRA's argument that a seven-day waiting period for buying handguns will inexorably lead to a prohibition on owning any firearm, so am I suspicious of van Bakel's argument that ratings on videogames will inexorably lead to ratings on books.

And finally, other media have survived rating systems quite nicely. I think you'd be hard-pressed to argue that movies have less independence and less political speech than they did before the rating system was imposed. Likewise for comic books.

If van Bakel and the readers of *Wired* are serious about stopping a videogame rating system, they will just have to contend with some serious arguments, not the simplistic claim that ratings are the vanguard of utter tyranny.

Ben Hunt
Department of Politics
New York University
hunt@acfcluster.nyu.edu

Hey, I like a good blood-'n'-guts shoot-'em-up videogame as much as the next guy, but I have to add an important point that was not raised by Rogier van Bakel in his piece on the proposed videogame rating system: kids. Van Bakel's casual assertion that "the violence graph has actually been pretty flat for years" is simply not true.

Over the last 10 years, the number of violent crimes committed by children has skyrocketed. While the desensitization-versus-catharsis argument over the effect of violent visual media will likely rage on, it's pure common sense that certain images are inappropriate for children. Children do not always have the social sophistication of adults in discerning fantasy from reality.

All too often, this is proven in our criminal court system. And, no, you don't always get the complete content information for a game or interactive movie from its wrapper.

My opinion will doubtlessly not sit well with the woolly-hatted rave-going contingent of your readership. Having been a similar counterculture type some 10 years ago, I understand the feeling. But I simply cannot see the point of bashing any attempt to warn parents that the game they're considering for junior's birthday may contain a rape scene.

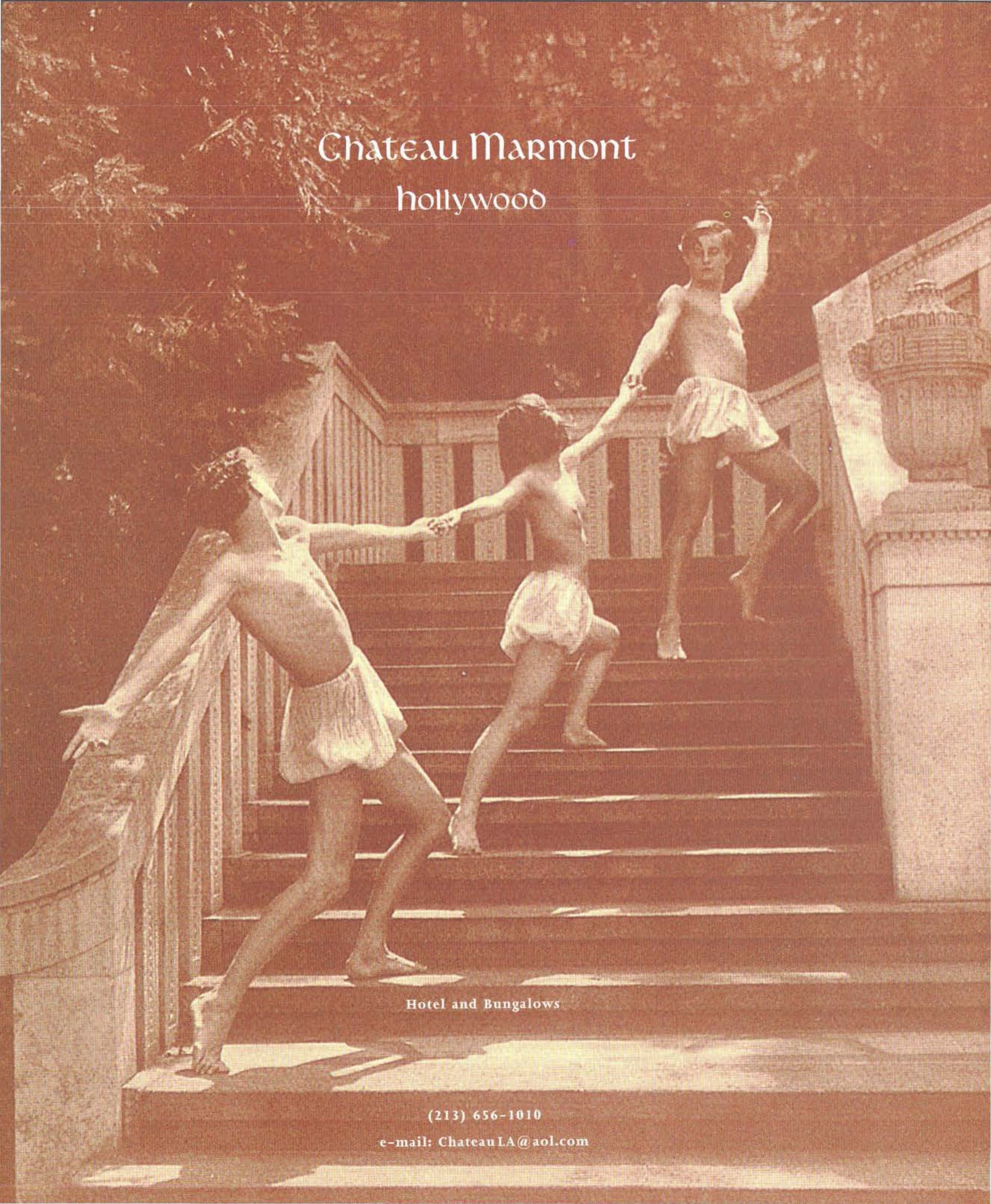
Chris Maddi
Chicago, Illinois

While I do mind having government in the faces of the people – especially when it comes to censorship – it scares the hell out of me to think that the production of Level 4 games is necessary to keep the masses happy.

People have become numb to the input they receive. It's amazing there aren't more mental cases running around, reliving their favorite scenes from these games.

Michael Archibald
archibal@cimtegration.com

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Rock the eVote – Privately, Please

As one who has chaired panel discussions on electronic voting at the Computers, Freedom & Privacy and National Computer Security conferences, I would like to briefly comment on your eVote article by David Voss ("Making Cyberspace Safe for Democracy," *Wired* 2.11, page 42). I have met Marilyn Davis, spoken with her about her product, and perused her documentation and other materials. I find her to be tremendously naïve regarding computer security issues.

The National Institute of Standards and Technology has an extensive set of procedures for creating and validating private and secure systems. I would urge Davis to consider certification of her product by the institute, and would also urge her not to promote it as either private or secure until and unless she has done so. She does a disservice to the entire computing community by misleading people otherwise.

The issues regarding electronic voting are numerous. For a better look at them, please refer to the 1993 NCSC proceedings (available free from the National Institute of Standards and Technology) as well as my articles in the November 1992 and 1993 *Communications of the ACM* on electronic voting.

Rebecca Mercuri
Research Fellow, University of Pennsylvania

If Rebecca Mercuri has a specific technical beef about eVote, she should make it, and make it quick. EVote is proceeding. We don't need to show you no stinkin' badge.

Nevertheless, privacy, security, and user confidence are paramount to the eVote mission. While secure electronic vote counting was once considered impossible, with encryption the rules change. Encryption means we can now keep our ballots online and still keep them private. Because the ballots are kept, tallies can be redundantly and independently calculated for double security. This opens the door for a new generation of democracy tools. The eVote system is just a seed.

While I have an aversion to bureaucracy (after all, bureaucracy and politicians are exactly what eVote obsolesces), I would subject eVote to a fair and open bureaucratic verification process if Mercuri or someone else would foot the bill. – Marilyn Davis

Hack the HOPE

At first glance, Charles Platt's review of the Hackers On Planet Earth (HOPE) conference ("Hackers: Threat or Menace?," *Wired* 2.11, page 82) appears to be a parody of itself. Here is an article that makes fun of journalists attending the conference searching unsuccessfully for criminals, is written by a journalist doing just the same, and ends up with genuine disappointment at not finding any crime. It doesn't take long to realize that Platt takes his judgmental little discourse very seriously, however. Like so many before him who have attempted to cover the hacker world, he just doesn't get it.

Platt strongly implies that *2600* corrupts people by providing a forum for hackers, an accusation I find offensive and typical of those sensationalist reporters who will concoct any fact to sell a story. *2600* provides a vital service to people who are curious – it disseminates obscure information.

Of all those in attendance, the vast majority were captivated by something or someone at some time during the conference. The rather simple moral here is that if you spend all your time looking for things that don't exist, you'll wind up being very disappointed. It's too bad *Wired* readers were robbed of the chance to see the significance of the largest hacker event in history.

Emmanuel Goldstein
HOPE co-organizer and *2600* editor
emmanuel@well.sf.ca.us

In *Wired* 2.11, you published another article idolizing so-called "hackers."

I was a teenager who couldn't get girls once, too, and I know very well that what hackers do has little to do with "freedom of information," and a lot to do with pissing people off for the sole purpose of feeling like a big shot.

The bottom line is that these self-seeking nerds will crack the Metrocard, costing taxpayers millions to have somebody figure out a hacker-proof security system. Some information is better left unliberated. To willfully and pointlessly expose other innocent people and organizations to loss and harm is irresponsible to say the least.

Wired's fawning attitude toward these hard-up, petty data-vandals doesn't advance our society one bit. Let's see a hacker break into *Wired* and scramble your hard disks just before press deadline: we'll see how cool you think they are then.

Jeff White
Cedar Crest, New Mexico

This Bill Will Truly Cost You

Things are looking pretty bleak for the Net community when a good reporter like Brock Meeks produces the no-resemblance-to-reality report on the FBI wiretap bill that appeared in the October issue ("Spooks in the Machine," *Wired* 2.10, page 31).

The wiretap plan was dead in the water until the "Digital Privacy Working Group" (a Washington trade group) signaled its willingness to cut a deal with the FBI. The bill obviously covers the Internet (it even discusses access to subscriber records), expands wiretap authority (Section 103), and extends warrant authorization (Section 208). Subpoenas – not warrants – continue to provide the government with access to online records (Section 207). The line about how the bill "doesn't let the bureau get its hands on the coveted Internet or any other online system" must have been an extended typographical error.

The bill encompasses mandatory wiretap standards for every telecommunications carrier in the United States (Section 103); the wiretapping "wish list" of the Attorneys General (capacity requirements for wiretapping, Section 104); new wiretap obligations for industry groups, standard-setting organizations, professional associations, and state utility commissioners (Section 107); and US$10,000 per day fines for telecommunication companies, manufacturers, and providers of telecom support services that aren't wiretap ready (Section 201).

As for the democratic process, the bill literally passed in the middle of the night. There were no recorded votes. Many Senate staff members had been told the legislation would be put off until next year, when there would be a chance for real debate. Who lobbied for the bill? The FBI, the NSA, the CIA, and Naval Intelligence.

This FBI wiretap bill puts the Attorney General smack in the middle of new network technologies. If you liked Clipper, you'll love Digital Telephony. And don't forget the $500 million in taxpayer dollars that will go to the companies that fund the Washington lobby groups that pulled off this masterpiece (Section 110). Just for the record, EPIC, the ACLU, Voters Telecomm Watch, and the US Privacy Council opposed the bill.

Best of all, we now have the pleasure of paying for all of this nonsense.

Wired bought the same line as *The New York Times* and *The Wall Street Journal*. I will bet money that none of the reporters read the bill.

Marc Rotenberg
Electronic Privacy Information Center
rotenberg@epic.org

I say it's a sad day when EPIC – the best "roll-up-your-sleeves, let's fight this 'til we drop" privacy group around – comes off sounding like a sore loser.

Yes, I have read the bill. It doesn't allow the FBI wiretap access to electronic data communications as the FBI pushed for in the first couple of drafts. Yes, they can get access to Internet "records," meaning certain transactional data and e-mail, but they've always been able to do that.

This bill doesn't provide any extraordinary access to those records, and, in fact, a bit more protection has been added to the bill regarding the "transactional" records.

These records include: who sends mail to you, whom you're receiving mail from, as well as the subject lines of those messages; what Usenet newsgroups you subscribe to; what pay-per-view movies you've ordered. Before this bill passed, the FBI could get all that information with a single subpoena ("Give it to us. Now"). Now, they must get a court

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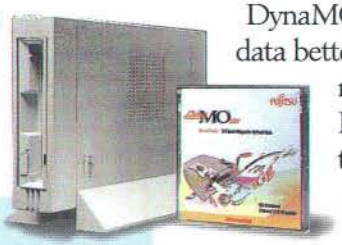


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order to get that same information. The court order requires law enforcement agencies to show a cause of "specific and articulable facts" that any such record has direct bearing on a criminal investigation. This keeps the FBI from going on a "fishing expedition" through your online transactions.

Now this isn't the level of protection that EPIC wanted, but it's better than nothing. At least the FBI will now have to jump through a few extra hoops to get the records. It won't stop them – hell, it probably won't even slow them down. Nonetheless, those extra steps are still there.

Another important point is that the FBI et al. won't be able to frontload electronic communications networks with wiretap capabilities, as they once would have liked.

As to your remarks about how the bill "encompasses mandatory wiretap standards," there is no debate there; I never refuted that. In fact, I derided this aspect of the bill in my widely distributed CyberWire Dispatch as "the nationalization of the US telephone network."

Nobody likes this bill. Not you, not me, not the telephone companies that must comply with it. I called it "chemo from Congress." You know what effect chemotherapy has on a person, don't you? It makes you deathly sick; it damn near kills you while offering the hope of saving you. This bill operates in much the same way.

Would it have passed in the 104th Congress as a more onerous bill? You're damn right it would have. Just take a look at the GOP leadership and you'll see it would have been a slam-dunk for the FBI. In fact, they're probably sick now that they "collaborated" with the Electronic Frontier Foundation, as FBI Director Louis Freeh characterized his working relationship with that group. If Freeh hadn't had such a hard-on for the bill, he could have gotten his first or second draft passed. Not a pleasant thought, I know.

For the record, EPIC does one hell of job all the way around, bar none. I've told you that before this bullshit letter was printed and I'm saying it again, in print. You guys do great work.

Meeks out...

We're Teen, We're Queer, We Have Friends

Kudos to Steve Silberman for "We're Teen, We're Queer, and We've Got E-mail" (*Wired* 2.11, page 76). And an equal round of applause to *Wired* for having the courage to address such an important matter.

When I was coming out (nearly 30 years ago), I wasn't simply hoping to get laid. I was looking for friends with shared interests, people I could relate to on an intellectual and compassionate plane, and, more than anything else, guidance. Had the gay schoolteachers who I now know were on the faculty not been so terrified of being "exposed," they might have been able to help hundreds of students avoid long hours of gut-wrenching angst simply because they had no adults in their lives with whom they could safely share their thoughts.

While some people rage at NAMBLA, others assume that all gay teens want to do is have sex. A much more important issue is at stake. Teenagers, gay or straight, have difficulty communicating their thoughts and being taken seriously by adults. Online services allow gay teens to communicate with others. Support systems can be built.

If more gay teens had access to gay cyberspace, we might have fewer teen suicides – and many more well-adjusted gay adults.

George Heymont
heymont@backdoor.com

Thank you for your ongoing commitment to covering gay issues as they relate to the Net and burgeoning technology. Your article in 2.11 was terrific.

Unfortunately, gay teenagers account for roughly one-third of the teenage suicides in this country. The lack of role models as well as sources of reference material can create an awesome feeling of isolation. How wonderful that something like the Net is able to link these teenagers struggling to come to terms with, and understand, their sexuality. I only wish that something like this had been around when I was coming out.

Andrew C. McGibbon
bway@ix.netcom.com

Vive la Révolution

Wow! As a jaded Ivy Leaguer who has spent a lot of time working with politicians and media mavens, I am not wowed by every new product that comes down the pipeline. That's why I just wanted to write and say how impressed I am with both *Wired* and your new service *HotWired*. In fact, *Wired* magazine is one of the main reasons I'm going to graduate school next year – not to study dead philosophers and irrelevant postmodernists as I once planned, but instead to study the intellectuals who really matter today, those who are planning the next phase of the information revolution. Thanks for your help in opening the door.

Jeremy Carl
carlj@minerva.cis.yale.edu

Time to Walk the Walk

I am becoming increasingly impatient with the decidedly boogie-white-male, "liberal" slant with which *Wired* approaches certain issues concerning communications technologies.

Wired seems knee-deep in a kind of "white male"-ness that is more of a consciousness than a statistical state of being determined by skin color or genitalia. In other words, I am not as concerned with the number of "actual" white males who occur in the mag, either as writers or subjects, as I am with the specific nature of the content.

In "Conspiracy of Heretics," Joel Garreau discusses the Global Business Network at length, alternately referring to it as a "men's club," "brotherhood," and "fraternity" without once offering a critique of the very limited membership in this powerful élite. When, a few pages down the road, he finally does make a nod to the issue, we encounter the tired and pathetic excuse that there aren't any "professional scenarist[s] with lots of experience who [are] women," but it's getting more "diverse" every day – just wait a few years.

The major problem arises out of the fact that *Wired* masquerades as a "liberal" publication and therefore professes to speak, in a certain sense, for "everyone," when in fact it does not.

You can talk the talk, but I think *Wired* could really benefit from walking the walk a bit more. You seem afraid to confront some of the less- (or un-) explored implications of new technologies, new power bases, new epistemologies, new heresies that exist beyond the easily identified movers and shakers in these new halls of privilege.

Natsioux
happa@aol.com

Dawn of the Living Data

Regarding Phil Agre's article "Living Data" in Idées Fortes (*Wired* 2.11, page 94), I was intrigued by the premise, but feel that Agre stopped short of the real leap we need to make in our conceptualization of data and how "alive" it is.

Instead of trying to animate the dead (in effect creating a myriad of Frankenstein's monsters by weaving together reanimated fragments of reality called "data"), I propose that we should instead be reconsidering the foundations of how and why we use computers, and in what ways they can most productively supplement our own capabilities.

For instance, we should concentrate our efforts on growing or breeding neural networks or similar logic systems which can accurately model complex processes such as the behavior of a group of consumers. In engineering, we should enhance our techniques of VR simulation and parametric design to more quickly and accurately model real objects (or systems of objects) – changing their properties by specifying what we want the object to do, not how we wish it done. Computers are capable of performing all the processes that engineers follow in their heads when designing an object, except for the initial step of desiring a better object.

These types of capabilities would increase our productivity tremendously, and cannot, I believe, be attained by simply making individual bits of data more complex or active. If we can successfully draw the virtual and actual worlds closer together, then we

PC Magazine's Editor's Choice Awards "A quantum leap in accessing the Internet."

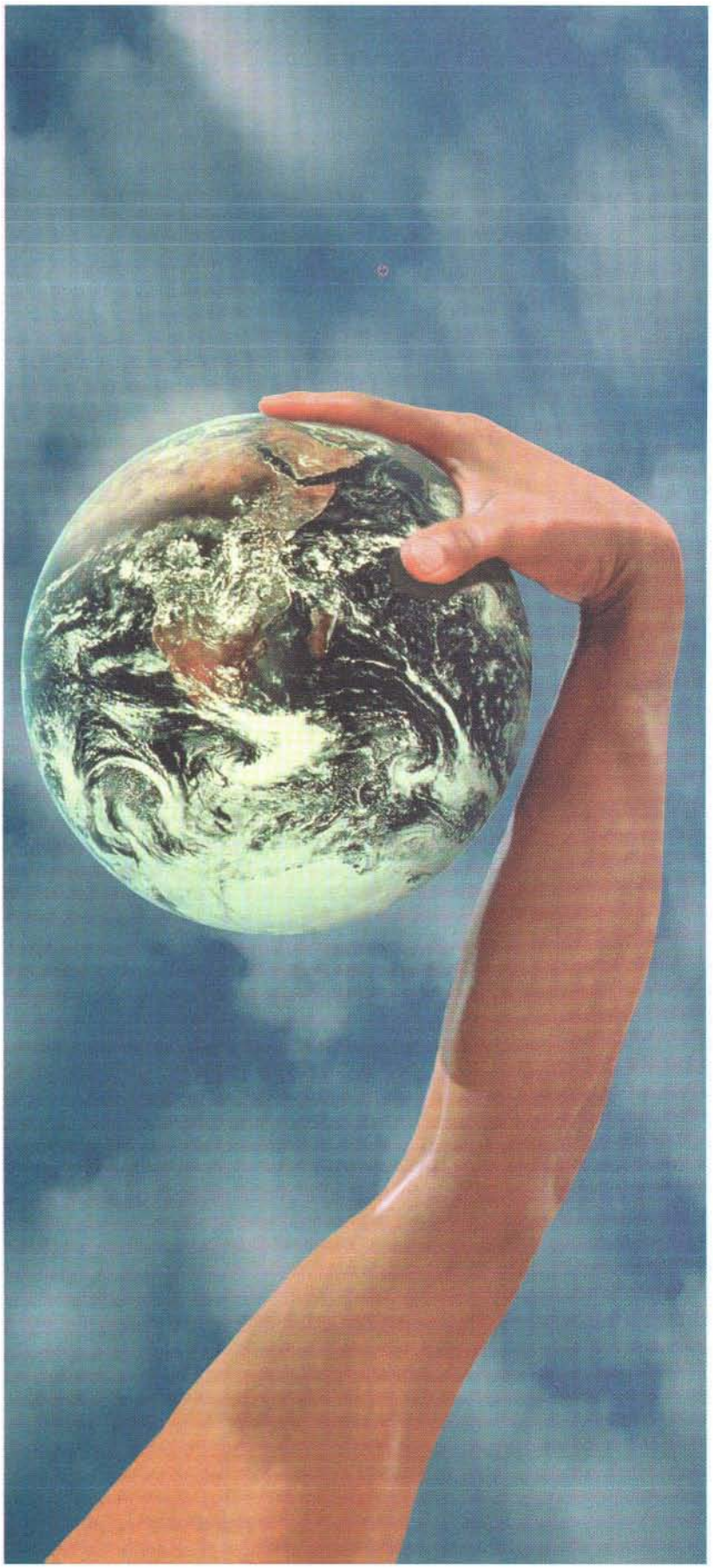
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can eliminate the need for "data," living or otherwise, in a myriad of analysis-intensive tasks.

Even for purely tabulatory applications (inventory, personnel records, bookkeeping), perhaps we should concentrate on producing holistically accurate virtual mirrors of the individual things we want to keep track of. With such objects, anyone could then extract whatever individual parameters needed from the whole and consistent entity when necessary. The issues of ownership and security would be even more vital regarding such objects in such cases, but would also tend to relate more directly to established concepts of property rights. For example, the virtual mirror of me as an individual, including my health statistics, spending habits, political leanings, should be owned and controlled by me since in a real sense (virtually real?) it is me. I propose that our ultimate goal should not be to liberate our data, but to liberate ourselves from our data.

Michael W. Shaffer
mshaffer@globalvision.net

In Idées Fortes, you argue that data should be brought to life. In fact, knowledge bases in artificial-intelligence experiments, expert and decision-support systems, and even to some extent relational databases, have long depended on "live" data: many epistemological databases include secondary data on the nature of reliability.

Data is not likely to come to life across cyberspace, because there is no standard for live data. The closest we may get to widespread use is through some form of dynamic hypertext system that transparently stores links as textual information transmitted from person to person.

Rishab Aiyer Ghosh
rishab@arbornet.org

Clean and Sobered-Up

The experts' estimates for a "sober-up drug" that reverses the effects of alcohol are off by many decades ("Reality Check," *Wired* 2.10, page 46). Such a drug was invented by Roche some 10 or more years ago.

The company's decision not to market the drug for "ethical reasons" made all the major news, domestic and foreign. You should have no trouble finding a reference in the *New York Times* index.

I am surprised that none of the experts seems to remember this.

Lucky Green
shamrock@netcom.com

(50) Mile-High Misunderstanding

Your article on space amateurs has a common fundamental misunderstanding – that space begins at 50 miles up ("Tired: NASA; Wired: Amateurs" *Wired* 2.11, page 68).

No physical or even legal demarcation establishes just where the atmosphere ends and space begins. In fact, the atmosphere begins to thin from sea level, becomes unbreathable at an elevation of between 3 and 6 kilometers, becomes a fairly decent industrial vacuum at 100 kilometers, and persists to several hundred kilometers as traces of atomic oxygen then hydrogen. The International Astronautical Federation sets 100 kilometers as the minimum altitude for records (thus, most X-15 flights were considered to be inside the atmosphere), although no orbit below 160 kilometers is considered stable (the Space Shuttle usually orbits at 223 to 300 kilometers).

Because the technologies of atmospheric and orbital vehicles continue to change, no nation has wanted to set a legal boundary akin to the 3-mile limit for the high seas (set by the range of early shore artillery; antisatellite missiles can reach in excess of 200 kilometers).

Dave Dooling
Huntsville, Alabama

Chicago Isn't Such a Cool Place After All

In your November 1994 issue, you mention two interesting things: people are hungry for new views and outside-the-box thinking; Windows 95 will include built-in Internet capability.

Microsoft is old news. You're right – they'll probably rope people into their own online service.

But meanwhile, back at the ranch, IBM has built a global Internet access service (Internet in Croatia, anyone?) and has added the front end of that service to every copy of OS/2 that's shipping.

The Internet service is open: anyone who talks SLIP (OS/2 or no) is invited. The graphical front end is open: you can use the OS/2 tools to dial up and navigate any Internet service, not just IBM's. The TCP/IP stack is open: you can run anyone's OS/2 or Windows Winsock apps on top of the stack and the service.

Get out of the Microsoft box! I'd love to see a fair evaluation of IBM's new service in the pages of *Wired*. Your only discussion of it was months ago, when you incorrectly surmised that IBM was trying to rebuild the Internet.

(I'm an IBM employee, but this letter is personal, and does not represent blah blah blah.)

Duncan R. Strong
dstrong@vnet.ibm.com

"Readers of this space know that Bill & Co. have plans for an online service in the near future, and that Windows 95 (formerly Chicago) will include built-in Internet capability if and when it ever ships." (*Wired* 2.11, page 38.)

But, because of a strange black hole in the media, they probably don't know that OS/2 Warp provides the same Internet features that Chicago promises, except that OS/2 Warp is available now, not some time in the distant future.

Frankly, your coverage of OS/2 has been abysmal. This is typical of the popular press, but inasmuch as you claim to be covering the leading edge, I would have thought that a cheap, comprehensive Internet package that runs on 386DX or higher, with 4 Mbytes of RAM or more, is more useable and more reliable than Windows, and is DOS- and Windows 3.1-compatible, might be worth a mention somewhere in your column.

Of course, I'm an IBM employee, so I don't depend on *Wired* for coverage of IBM or OS/2. Thank god.

(Disclaimer: speaking on my own behalf, not IBM's.)

Name and e-mail address withheld on request

The Taste of Success

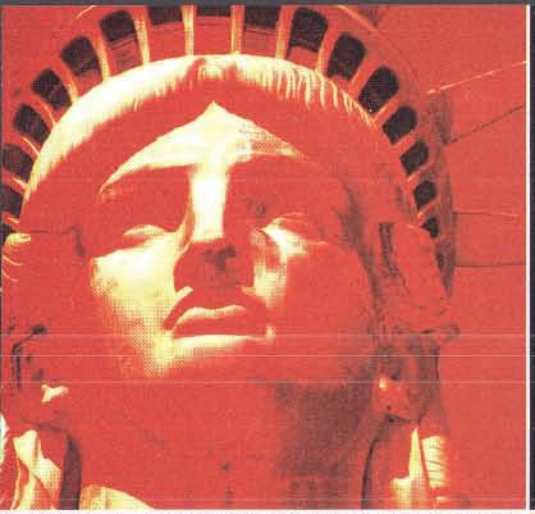
Perusing *Wired* is like walking into a really good restaurant and smelling 1,100 different dishes at once, each one of them promising a different, wholly satisfying gustatory experience. I enter each issue with the same reaction; then I look around and realize – how the fuck am I going to read everything?

Tom Marble
Los Angeles, California

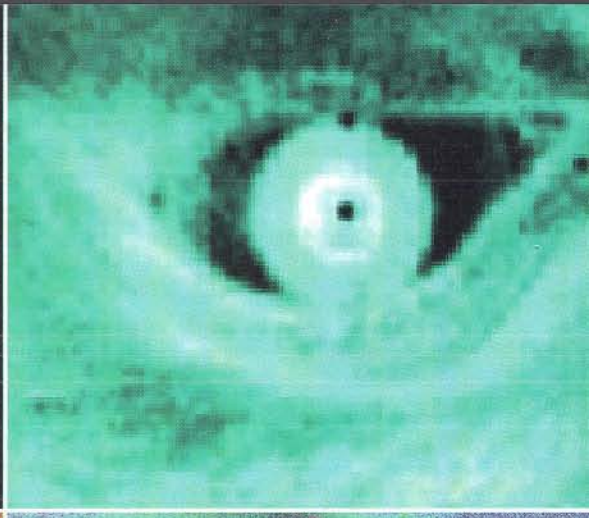
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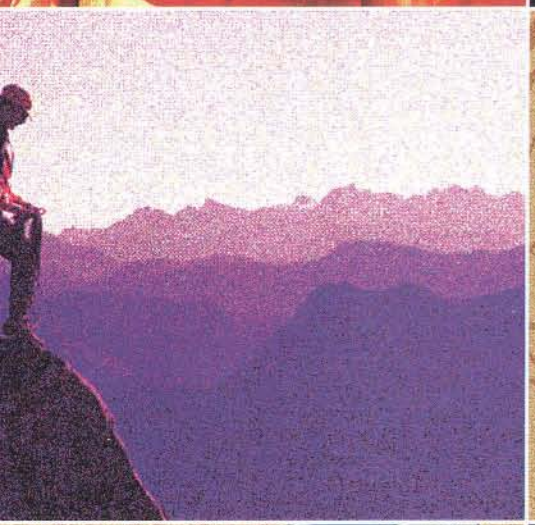
• Regarding the Bryn Mawr Classical Review mentioned in "Goodbye, Gutenberg" (*Wired*, 2.10, page 68), the current URL is *gopher://gopher.lib.virginia.edu/11/alpha/bmcr*. • We mistakenly referred to *Super Metroid* as a 24-Mbyte game ("Femme Fatale Fantastico," *Wired* 2.11, page 133). Actually, manufacturers like big numbers, and, as such, measure game size in bits. *Super Metroid* is a 24-Mbit game. • Under the headline "Bringing Up RoboBaby" (*Wired* 2.12, page 74), we incorrectly attached Rodney Brooks to the Media Lab. He is with MIT's AI-Lab. • We included an extra slash in the Students for the Exploration and Development of Space's URL, in "Tired: NASA, Wired: Amateurs" (*Wired* 2.11, page 68). The correct address is *http://seds.lpl.arizona.edu/seds/seds.html*. • Did you miss the list of sources for the December, 1994 Raw Data figures (page 62)? Here they are: Veronis, Suhler & Associates; Wilkofsky Gruen Associates; Jupiter Communications, Electronic Industries Association, InfoTech, Software Publishers Association; Ernst & Young; and the Semiconductor Industry Association. • The correct e-mail address of Steven Levy, author of "E-Money (That's What I Want)" (*Wired* 2.12, page 174) is *steven@echonyc.com*. Also in that same article, the words attributed to Donald Gleason beginning with the phrase "It costs money..." were actually those of the author.

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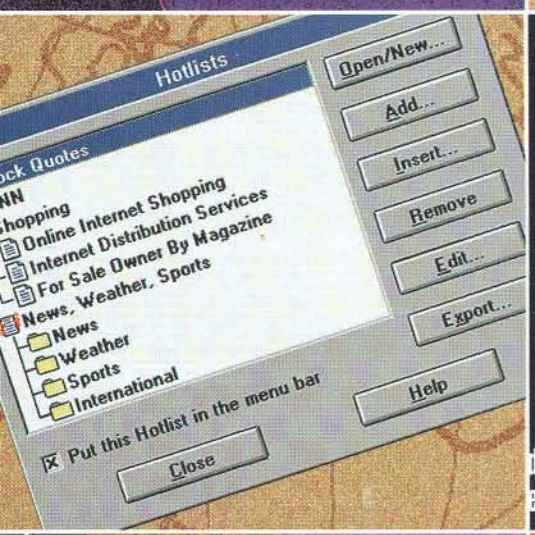


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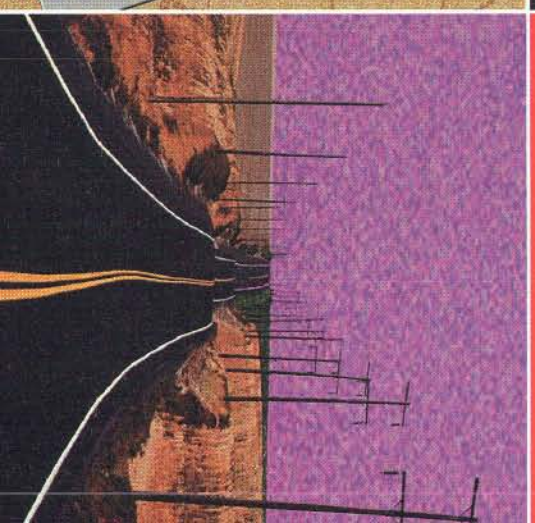


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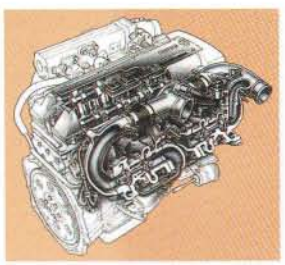
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* *Car and Driver* magazine test results published September 1993.

FCC: The Next Generation



It would be hard to top the hype that accompanied Rachelle Chong into her job as the youngest of five commissioners at the FCC. The 35-year-old Republican lawyer from San Francisco beamed up to Washington last spring by donning a pair of Spock ears during her swearing-in party, and wore a brightly lit Trek communicator pin during her first press conference.

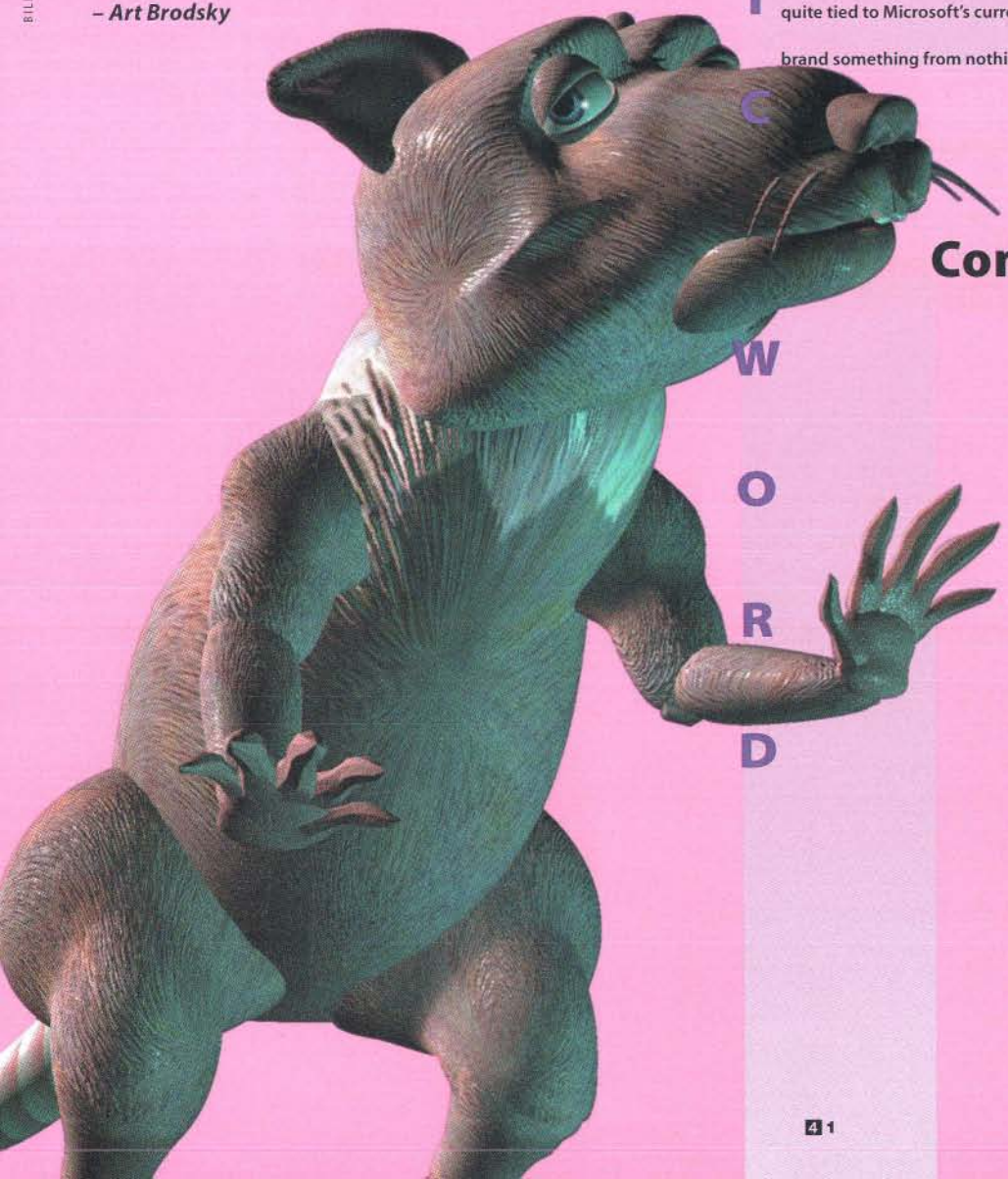
So far, Chong, the first commissioner to publicly utter the words "surfing the Net," has been maddeningly vague about how she intends to vote on Net issues. For example, on the crucial question of freedom of expression in cyberspace, she said: "At present, because I'm an admirer of the First Amendment, I advocate free speech. I wouldn't want to characterize my position as absolute, however." Maybe we should call in Spock for a Vulcan mind meld.

– Art Brodsky

BILL FAULKNER

ELECTRIC WORD

One-tenth of One Billion: That's how much Microsoft is spending on its current "Where Do You Want to Go Today" campaign, which is being called everything from "dizzying" to "beautiful." Created by Weiden & Kennedy, the agency that just did Nike, the series is directed by Tony Kaye, who won a Grammy for the Soul Asylum video "Runaway Train." The ads are downright gorgeous, though not quite tied to Microsoft's current reality. But that's the point of a saturation image campaign: to brand something from nothing. So where do we want to go today? Over to Egghead to pick up a

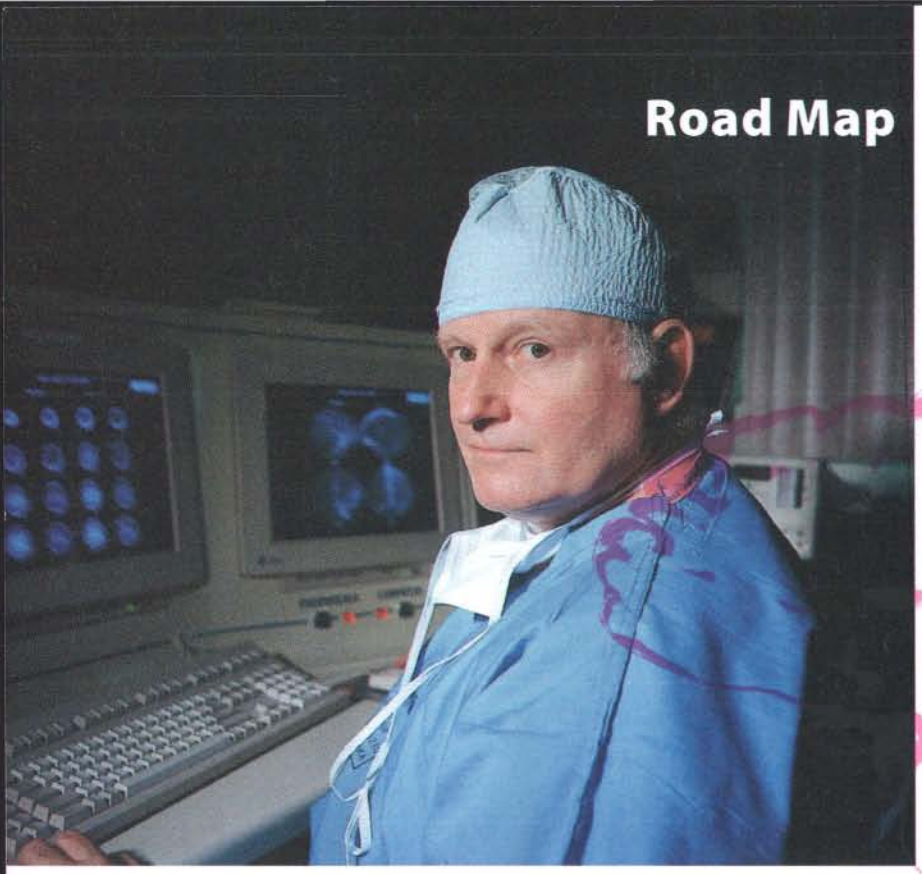


Coney Island of the Mired

It won't be out until the fall of 1995, but The Residents' *Bad Day on the Midway*, from Inscape, the hot-hot LA-based multimedia start-up, is already making waves in CD-ROM circles. Artist Jim Ludtke, the 3-D whiz who authored The Residents' *Freak Show*, should have another winner with this new title's brooding atmospherics and multiple points of view.

The setting is kinkier, more noir than *Freak Show*'s P.T. Barnum send-up. *Bad Day*'s carnival was built in the wrong part of town and hasn't been doing well lately. Players spend the day following the tormented wanderings of a dozen major characters and a host of bystanders, uncovering clues to their tangled pasts.

"The structure of most games is really confining," Ludtke observes. "It makes no sense to me that you should have to do a crossword puzzle or something to go through a door. Rather than drawing you in with a challenge, I want to draw you into the lives of the characters." Inscape: +1 (310) 312 5705. – *Ken Coupland*



STEVE FUGIKAWA

Road Map for Brain Surgeons

Many brain surgeries end up never being performed because the risks of making incisions based only on printouts of CAT scans and MRIs are too high.

But Compass, a US$450,000 system driven by a Sun workstation, now allows surgeons to use a heads-up display that superimposes digital images of CAT scans, MRIs, and angiogram data on the patient's brain, visually representing a tumor's boundaries *while* the surgery is performed.

Compass was developed under the guidance of Dr. Patrick Kelly, chairman of the neurosurgery department at New York University Medical Center. Twenty-four systems are already in use worldwide, and Kelly anticipates many major facilities will acquire them. "When patients are in a hospital that doesn't have one," he says, "they'll be sent across town to have the surgery." – *Paul McCarthy*

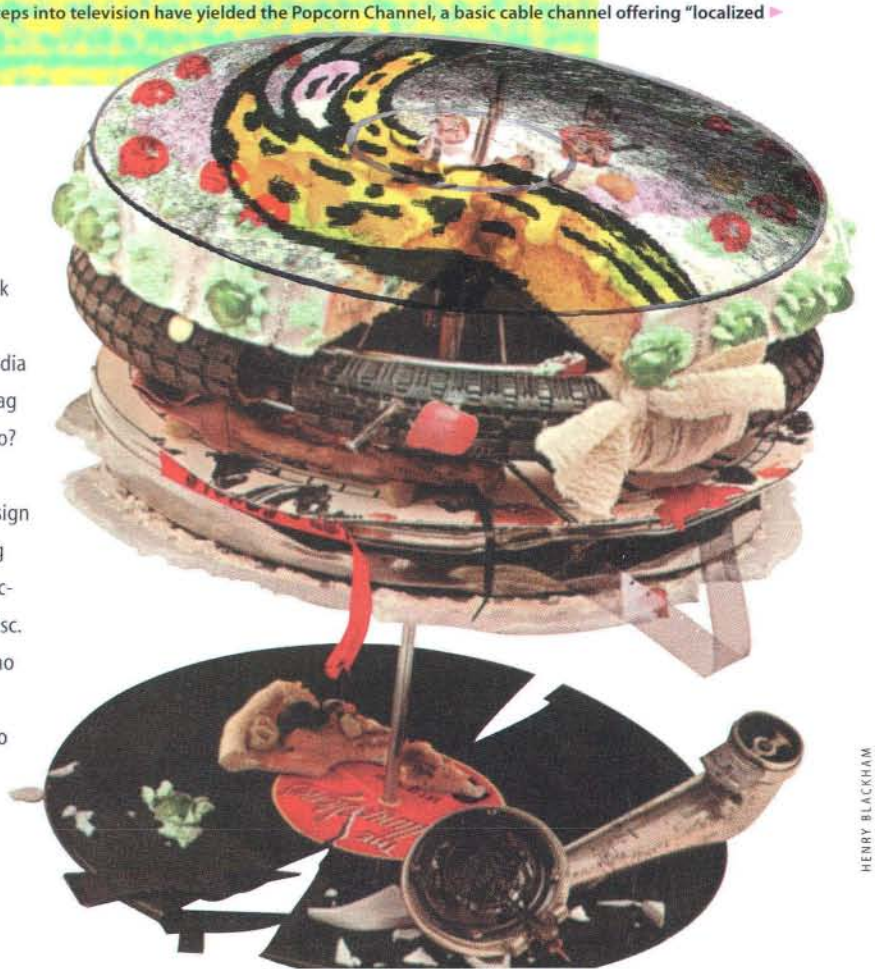
copy of WordPerfect. Still Not There Yet: A recent Forrester Research report claims the introduction of interactive television like Time Warner's Orlando test would cost cable and telephone companies at least US$1,700 per home, an investment that would take 10 to 15 years to pay back. The real focus of interactivity to the home, Forrester concludes, will be the PC and the Net. About time the rest of the world realized television is just another peripheral! For more on Forrester Research and its iconoclastic leader George Colony, see next month's issue. Speaking of Which: Five of the seven Baby Bells now have legal clearance to offer television programming over phone lines. Just thought you'd like to know. The Gray Lady Buys into Hollywood: The New York Times Company's first tentative steps into television have yielded the Popcorn Channel, a basic cable channel offering "localized

The Spinning Stones

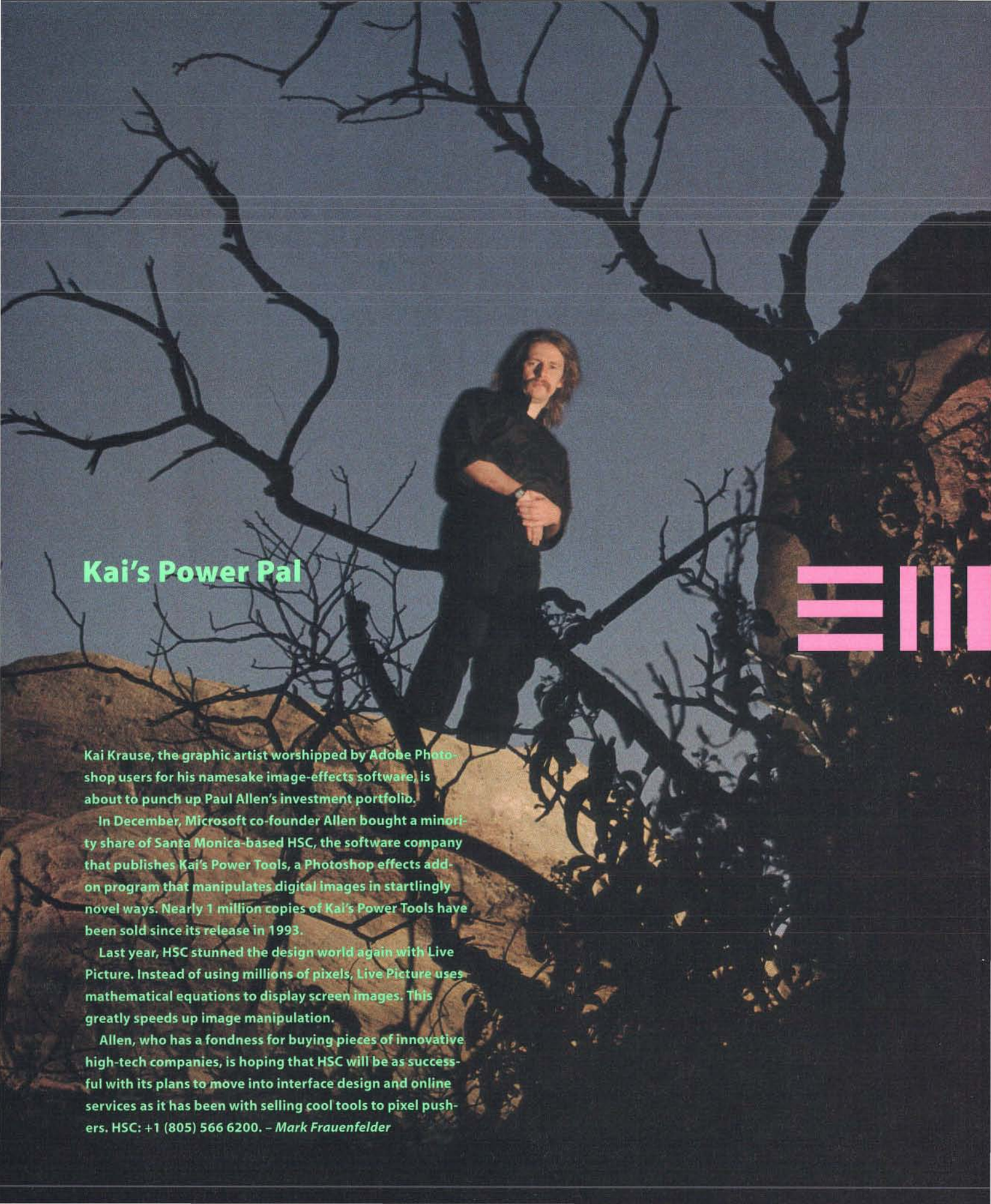
Mick and Keith have the resources it takes to make a CD-ROM look like a million bucks – the rumored cost of the Rolling Stones's upcoming *Voodoo Lounge*, due this Spring from Second New Media Inc. But will our 50 bucks get us anything besides the same old bag of tricks – will we get to remix a song or watch a tiny-screen video?

Mike Morgan, chief nerd and project director of the *Voodoo Lounge* CD-ROM, emphatically promises that this title, whose design is driven by the lounge metaphor, will be different. "You can hang with the Rolling Stones, as well as a variety of other bizarre characters, some based on Haitian *vodun* legends," he says about the disc.

The boys seem pleased with the results. When Mick saw a demo of the *vodun* dancers who vary their routines after a click of the mouse, it so captivated him he asked for a copy of the creatures to take home. – *Allan Lundell*



HENRY BLACKHAM



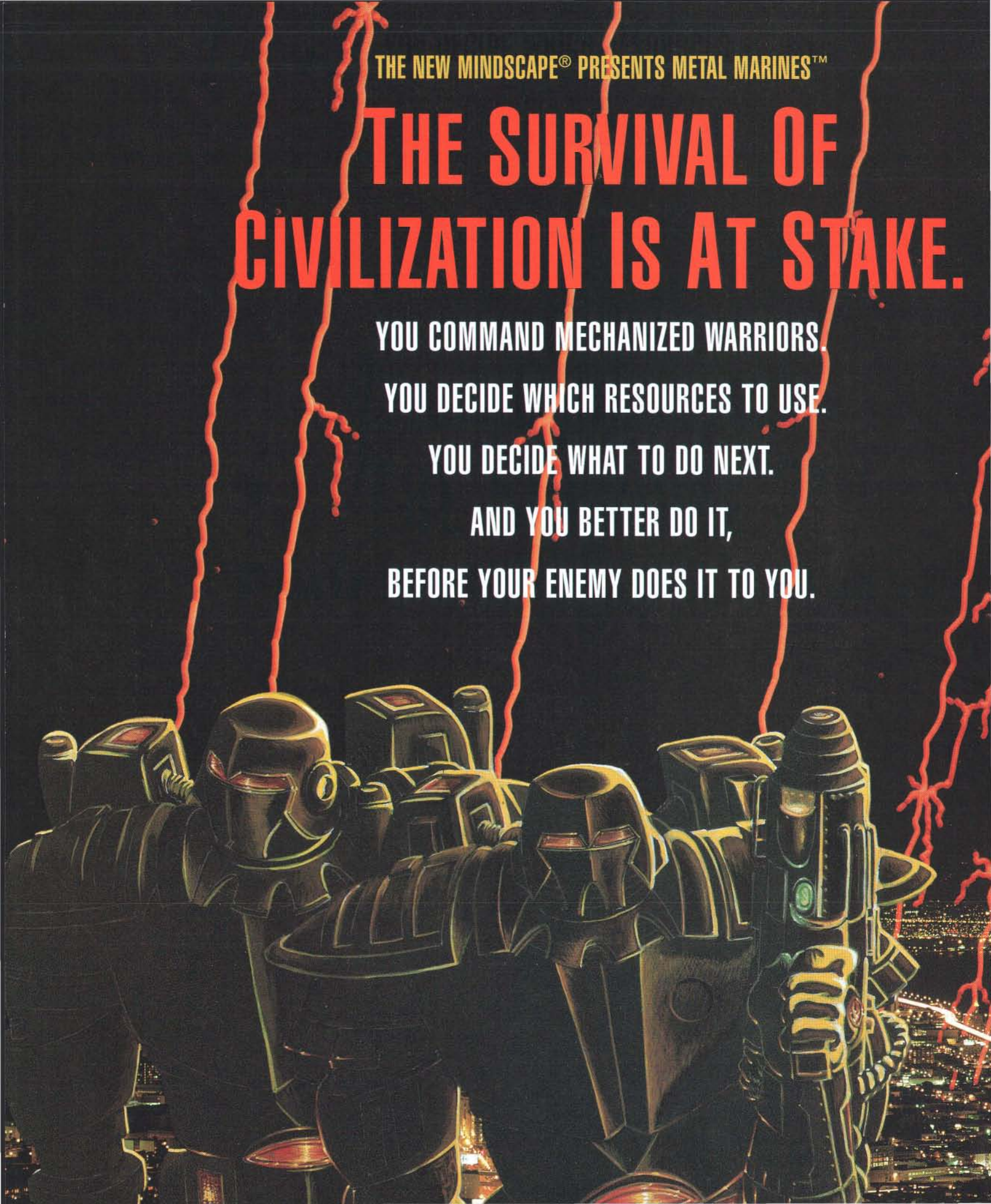
Kai's Power Pal

Kai Krause, the graphic artist worshipped by Adobe Photoshop users for his namesake image-effects software, is about to punch up Paul Allen's investment portfolio.

In December, Microsoft co-founder Allen bought a minority share of Santa Monica-based HSC, the software company that publishes Kai's Power Tools, a Photoshop effects add-on program that manipulates digital images in startlingly novel ways. Nearly 1 million copies of Kai's Power Tools have been sold since its release in 1993.

Last year, HSC stunned the design world again with Live Picture. Instead of using millions of pixels, Live Picture uses mathematical equations to display screen images. This greatly speeds up image manipulation.

Allen, who has a fondness for buying pieces of innovative high-tech companies, is hoping that HSC will be as successful with its plans to move into interface design and online services as it has been with selling cool tools to pixel pushers. HSC: +1 (805) 566 6200. – *Mark Frauenfelder*


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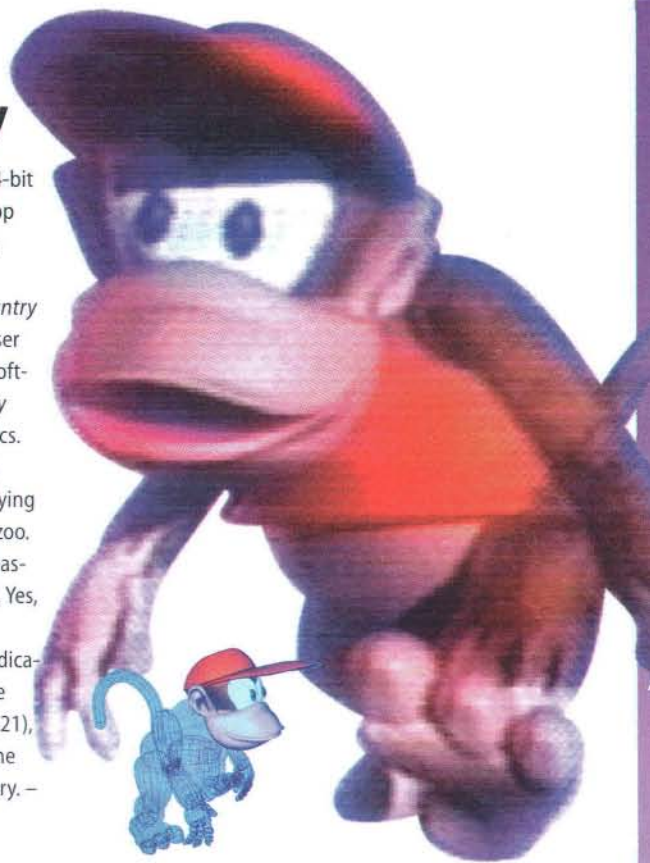
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Big Monkey



While gamers hold their breath for 64-bit systems, Nintendo has landed a wallop with its new *Donkey Kong Country*, a huge, 32-Mbit SNES cartridge.

The irony is this: *Donkey Kong Country* looks better than everyone else's teaser shots of technically more advanced software and hardware, thanks to *Donkey Kong*'s ray-trace rendered 3-D graphics. To create a big ape with more lifelike manners, designers spent hours studying and videotaping gorillas at a nearby zoo. The onscreen interpretation has a pleasantly lurking, simian feel. You'll think, Yes, this really is how a gorilla boogies.

And if prerelease orders are any indication (more than 2.2 million before the game hit store shelves on November 21), *Donkey Kong Country* is set to become the biggest videogame seller in history. – *Joe Hutsko*

TIRED	WIRED
Dee-Lite	Pizzicato Five
NSFNet	CIX
Chaos	Nonlinear control
Windows95 beta	Cairo alpha
Slackers	Clerks
Road-related terms for the Net Organism	The Net Organism
16-Meg RAM chips	256-Meg RAM chips
Welfare reform	Social-security reform
Heidi Fleiss	Webb Hubbell
Term limits	PAC limits
Web sites	Web transactions
CEO Bill Gates	"Directed by Bill Gates"
Green Day	Rancid
"Information wants to be free"	"Information wants to be alive"
Frank Sinatra and Bono	Tom Jones and the Cramps
Ed Wood	Russ Meyer

movie theater listings." But wait, there's more: "As The Popcorn Channel develops," a press release trumpets, "also to be offered are movie and entertainment-related products through its 'Entertainment Superstore' as well as ticketing services." Added bonus for some time in the future: vague "multimedia and online products." Is this maximizing the *Times*'s value chain? And what would cable mogul Scott Sassa have to say about this? (See *Wired* 3.03) ▤ Politicians and the Net: Seems that in their rush to get wired, a few politicians have run smack into the reality of net.life. Bob Rae, the premier of Ontario, Canada, recently made quite a bit of noise about having his own e-mail address *(premier@gov.on.ca)*. He quickly found his account identity-hacked. Posing as the premier, a hacker posted less-than-flattering comments about Ontario's parliament and Rae's own cabinet. Mea while, over in Britain, a department for open government had its spanking-new Web site open for not more than six minutes before a Web spider hit th site, hacked it, and redesigned several of the pages to his own liking. Quoted in London's *Guardian* newspaper, Britain's minister of science had this to

Naughty Dog Does Good

You think those Miller boys who created *Myst* are the only *Wunderkinder* of the gaming universe? Nope. The hottest game developer around is Naughty Dog Inc., a team composed of coder Andy Gavin and artist Jason Ruben. They're young (both 24), bright, and wealthy – their latest project, the fighting game *Way of the Warrior*, has quickly become one of the best-selling 3DO Multiplayer titles of all time.

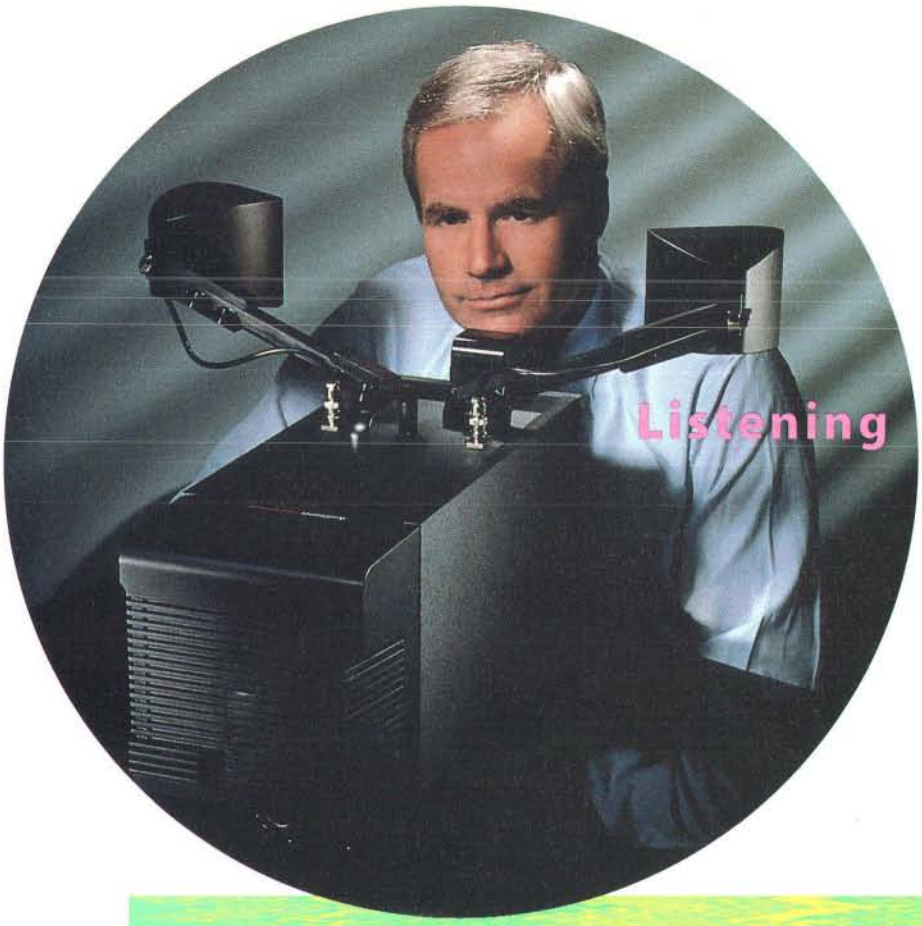
Naughty Dog got a first-look deal with Universal Interactive Studios last year and relocated from Boston to a plush office at Universal Studios in California, "right up the stairs from *SeaQuest DSV*," Rubin says.

The duo can't talk about their next project – not unusual in the amusingly paranoid game industry – but they can reveal the origin of their company's name. It was inspired by Morgan, their beloved Rhodesian Ridgeback. "We got Morgan a photo ID card so she can go anywhere on the studio lot," says Rubin. – *Zach Meston*

Naughty Dog Software/Universal Interactive Studios: +1 (818) 777 5400.



HENRY BLACKHAM



Listening to a Blueprint

A VR walk-through of a CAD model can offer valuable information about the way a building will look before it goes up, but predicting the way sound propagates through the structure isn't so simple. In 1992, Germany's parliament had to evacuate its new building after one day of use because the acoustics were so bad, people could barely hear each other.

In October, the speaker masters at Bose announced a system to help eliminate the guesswork that architects and engineers have grudgingly accepted as part of their job. Based on nine years of research, the system creates acoustical models of buildings based on architectural drawings and simulates the aural qualities of the building-to-be through an audio-playback device called the Auditioner. Speakers placed on either side of the listener's head deliver the sounds.

In tests conducted in existing public spaces, experts couldn't tell the difference between the real and the modeled sounds. Bose: (800) 469 7413, +1 (508) 879 7330. – *Mark Frauenfelder*

say about the incident: "In fact, he made them better, and the people who designed the pages accept that. The problem is, suppose somebody is able to hack into the system, changes the information, and somebody acts on that information. Whose responsibility is it? I don't know the answer. But I think you will be reassured that we at least are posing that question." Rest assured. Growing Global: Quick figure from NSFNet, keepers of the net.backbone in the United States: new foreign networks connected to the Internet will soon outpace those connecting from the US. Was It the Pentium?: Too late to include in our story on chess (see page 120), but grandmaster Joel Benjamin defeated a top-level chess program running on an Intel Pentium at the recent Harvard Cup Intel Championship Playoff. Interesting side ▸

JARGON WATCH

Stress Puppy
A person who seems to thrive on being stressed out and whiney. "I'd like to work with Patrick, but he's too much of a stress puppy ... everything's a crisis."

EMG
Acronym for Empty Magnanimous Gesture. As in: "We think your idea is great and would love to fund it, but [insert excuse here]."

Betamaxed
When a technology is overtaken by an inferior but better-marketed technology. "Apple was betamaxed out of the market by Microsoft."

Forelash (opposite of backlash)
Negative or indifferent reactions to nonexistent, but already overhyped technologies. Examples would include video-on-demand, 500 channels, interactive TV, and anything promised in the AT&T "You Will" ads.

Frankenedit
A gruesome job of editing a writer's work by a hurried editor. The frankenedited piece is usually returned with a note asking the writer to suture it back together and to breath life back into it (by the next morning).

Gang FAQ
When a group e-mails a FAQ to an individual who has asked a particularly stupid or old question on a newsgroup. Differs from a mailbomb in that each person sends only one copy, but numerous members of the newsgroup participate.

Hourglass mode
Waiting in limbo for some expected action to take place. Refers to the hourglass icon used in Microsloth Windows. "I was held up at the Post Office 'cause the clerk was stuck in hourglass mode."

Nooksurfer
Someone who frequents only one or two newsgroups, BBS topics, or logs on just to answer e-mail, never daring to venture out into the big waters of the Net.

– *Gareth Branwyn*

A tip o' the beret to: J Matisse Enzer, Jonelle Patrick, Will Kreth, Alberto Gaitan, Laura Lemay, Robert Lauriston, Shawn Wolfe, Clark4416



ReBoot, the first 100 percent computer-animated TV series (ABC: Saturdays, 9:30 a.m.), tells the story of Mainframe, a virtual city. The story centers around the hero, Bob, his friend, Dot, and a pizza-delivery kid named Enzo. They are pitted against a couple of wicked virus supervillains hell-bent on wiping Mainframe from the computer's memory.

Director Steve Barron, who brought computer animation to our television sets with Dire Straits's *Money for Nothing* video in 1985, pulled in *Teen Age Mutant Ninja Turtles* comic book artist Brendan McCarthy to add some spice to the series. "Barron called me because I could add a subversive element, taking *ReBoot* out of the blandoid hole of children's Saturday morning TV," explains McCarthy. Characters in *ReBoot* speak high-tech talk – incorporating computer terms in their own special dialect. Enzo is encouraged to "cut and paste" the truth. Dot counsels him not to "quit file" so easily. – *Niall McKay*

note: the computer lost on time, usually its strongest suit. Our conclusion: it must have gotten lost in a particularly tricky bit of long division. EFF Redux: The issues are simply too large to trust one group for protecting all our civil rights in cyberspace. Enter DigitaLiberty, "an advocacy group dedicated to the principled defense of freedom in cyberspace." From its mission statement, penned by Net maven and co-founder Bill Frezza: "DigitaLiberty does not seek to educate or influence politicians in the hope of obtaining legislation favorable to our constituents. We plan to make politicians and legislators irrelevant to the future of network-based commerce, education, leisure, and social intercourse." Interested? Send a message to *digitaliberty-request@phantom.com* with the word *subscribe* in the subject line and *subscribe digitaliberty <your name>* in the message body.

What People Really Want on the Net

In its October '94 issue, *MacWorld* magazine asked a reasonable question: What do consumers want on the infobahn? To find an answer, they surveyed 600 adults by phone, asking them to measure their interests in various proposed services, and to state which ones they would be willing to pay US$10 per month to get. The results of this survey were surprising, if not disturbing. Ranked from highest interest to lowest, *MacWorld*'s list shows that entertainment-based services – video-on-demand, gambling – are not the killer applications everyone expected. Instead the masses are craving … electronic voting and digital school!

Our take on this is that *MacWorld* got it backward. High-minded activities, such as obtaining legislative records or searching the card catalogs of libraries, sound worthy and uplifting. It's what most people think they *should* want to do. But judging from what people really do once they get onto the Net, we just have to flip *MacWorld*'s list upside down. Read in reverse, with no other alterations, this list now makes perfect sense. What are people really going to use the infobahn for? Sex, gambling, fun with role playing, sports, and chat groups. Oh yeah, and every now and then they'll take a few minutes to vote. – *Kevin Kelly*



MacWorld
What people think they want to do on the infobahn:

Vote in elections	Vote in elections
Search reference books	Search reference books
Take courses	Take courses
Obtain local school information	Obtain local school information
Search card catalogs	Search card catalogs
Participate in opinion polls	Participate in opinion polls
Obtain government information	Obtain government information
Get video-on-demand	Get video-on-demand
Search magazines/newspapers	Search magazines/newspapers
Search legal/scientific/medical journals	Search legal/scientific/medical journals
Obtain legislative voting records	Obtain legislative voting records
Obtain local crime information	Obtain local crime information
Obtain proposed laws, regulations	Obtain proposed laws, regulations
Send video/text e-mail to officials	Send video/text e-mail to officials
Obtain industry legal-compliance data	Obtain industry legal-compliance data
Obtain public records	Obtain public records
Conduct video telephony/conferencing	Conduct video telephony/conferencing
Conduct video or text discussion groups	Conduct video or text discussion groups
Obtain local event/marketing info	Obtain local event/marketing info
Sports video-on-demand	Get sports video-on-demand
Obtain sports statistics	Obtain sports statistics
Have role-playing interactions	Have role-playing interactions
Gamble	Gamble
Date by video	Date by video

Wired
What people really want to do on the infobahn:

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VOL. 130, NO. 1 JULY 11, 1994

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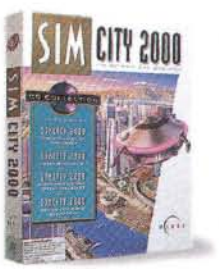
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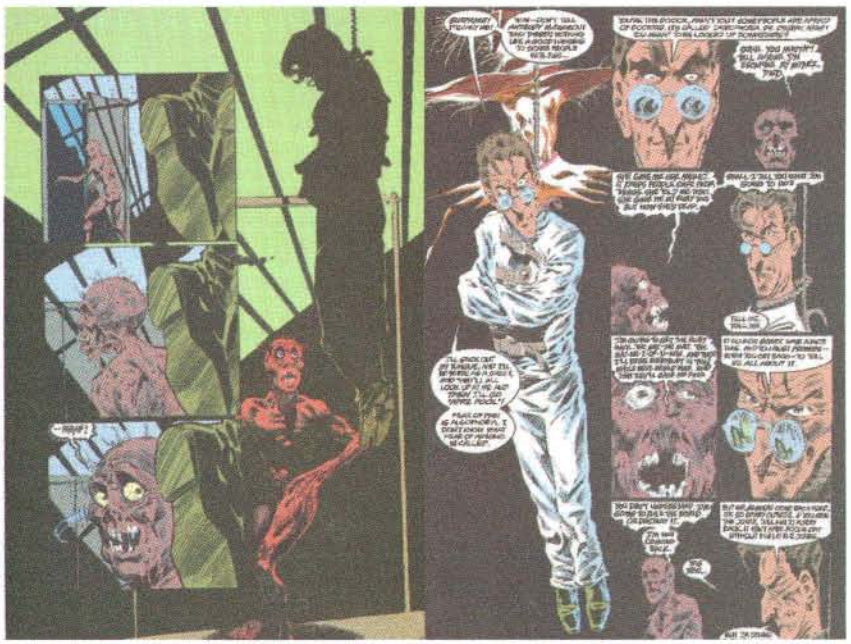
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A New Spin on Comics

Any artistic form, be it a Gregorian chant or photography, experiences periods of upheaval and experimentation, moments of discovery, and times when it returns to a more traditional path. Since the mid-1980s, comic books have been redefining themselves with a cornucopia of new titles and formats, and a dizzying array of spinoffs, including trading cards, dolls, toys, T-shirts, watches, models, videos, and posters.



Comics are mutating and spreading Netward in search of readers.

Over the last decade, the comic industry has enjoyed steady 10 percent annual growth, a rate that many other industries stopped dreaming about long ago. Marvel, home to two of comicdom's best sellers – *Spiderman* and *X-Men* – is listed on the New York Stock Exchange. The stock has split three times in just over three years. In Japan, sales of fat, pulpy comic books, or *manga* – which depict everything from a soap opera-esque hotel staff to a creep called Rapeman – make up one-third of all magazine and book revenue. In 1992, *manga* revenues totaled US$5 billion.

To capture more readers, publishers are going after people who wouldn't think to visit the local comic-book shop. One of their tactics is to develop comics with plots geared for more mature audiences. Neil Gaiman, author of *The Sandman,* a monthly comic book published by DC's edgy Vertigo line, is at the vanguard of comic writer/collaborators who gleefully experiment with their craft, blending refinement and revulsion like mad scientists tweaking the boundaries of the unknown. Each issue of Gaiman's *Sandman* is a brew of myth, fairy tale, esoteric arcana, odd historical personages, assorted immortals, deities and demiurges, dry humor, and often unadulterated horror. *Sandman* won the 1991 World Fantasy Award for the year's best short story – a first for a comic book.

Besides garnering recognition in the literary world, *Sandman* is raking in the bucks, with a monthly readership of more than 100,000 fans. This may not look like much compared to standard superhero comic books, such as Marvel's *X-Men* (Marvel printed some 7 million copies of a recent issue; typical cash cow titles sell a few hundred thousand copies per issue). But DC's expansion into alternative comics helps the company hold 20 percent of the $750 million comic-book market in the United States.

DC, Marvel, Fantagraphics, Dark Horse, Kitchen Sink, and other publishers have also cleverly taken to compiling and repackaging comics as both hard- and soft-cover graphic novels. Reincarnated as expensive compilations, titles like *Sandman* cost from $12 to $25 dollars each.

Comic-book publishers are trying to capture more readers by getting online and introducing new lines of mature comics. America Online subscribers can learn about Vertigo's latest releases in DC Comics Online (keyword DC). There are message boards and auditoriums featuring writers and artists. Weekly events on DC Comics Online include Wednesday evening chats with Vertigo editor Stuart Moore (9:00 p.m. PST). – *Jim Metzner*

DC Comics Online: *dcconline@aol.com*

Multimedia Gets Real

Fade in:
Exterior, cemetery – day

It is a gray, rainy day. A group of high school kids clutch each other, staring in silence as one of their own is lowered into a grave. Above background sounds of a plaintive dirge, we hear the frustrated voice of a priest.

PRIEST (off-camera)
Our children are dying. What have we done that our children are dying this way?

This is the opening scene of *Choosing Success,* a gritty, no-holds-barred multimedia education program aimed at teenagers that may just be the most inspired piece of educational software *ever* produced.

Computer Curriculum Corporation developed the software to teach students about suicide, violence, and racism. Middle- and high-school students pose as investigative reporters and create a multimedia news story.

They click on characters (including the girl who died) and trace their histories to see where and how they lived; to examine the choices they made that brought them to this place; and, it's hoped, to make different choices this time around.

What's remarkable about *Choosing Success* is that it explores in depth the real-world challenges faced by young people – from family problems and dating pressures to gang violence, drug abuse, racial conflict, and finding a job. And it does more than explore the issues. It uses a structured five-step process model – define the *challenge*, collect *information*, identify the *options*, choose an *action*, and verify the *outcome* – that helps students assess critical life problems similar to their own and then make appropriate decisions about them.

Directed by independent filmmaker Rob Nilsson, winner of the 1979 Camera D'Or at the Cannes Film Festival for his film *Northern Lights*, and co-written by Don Bajema and Doug Macbee, *Choosing Success* is stunningly shot and acted. All the actors are real inner-city kids – and what's more, their acting is top-notch.

Computer Curriculum is somewhat of a rare bird in the hype-filled and oh-so-trendy educational multimedia business. Its African-American CEO, Ron Fortune, spent many years teaching in inner-city schools. In fact, most of the company's top officers have primary backgrounds in education rather than technology.

Though it remains to be seen how successful this group of former educators will be at navigating the hurly-burly dynamics of the consumer CD-ROM business – they reportedly made US$85 million in 1993 – there's little doubt about the quality of their titles.

Choosing Success is so far available only to schools as part of the company's educational courseware line. But the company is about to enter the consumer education business with a host of multimedia titles, including *Amazonia*, a multimedia program deemed the "Best of Show" at the 1993 New York Festivals International Interactive Multimedia Awards, and *Virtual BioPark*, an ecology training tool. Both titles were developed in conjunction with the Smithsonian Institution, and like *Choosing Success*, emphasize real-world problem solving skills.

Says Fortune, "Our software's not just for reading or math, but for life." – *David Kline*

Computer Curriculum Corporation: (800) 227 8324, +1 (408) 745 6270.

Sorting Out Endangered Species

North American nature preserves have traditionally been chosen based on two criteria: esthetic value and economic worthlessness. If the place could be farmed, logged, mined, or built upon, it was an unlikely candidate for preservation. But if it was beautiful *and* remote *and* unexploitable, it was a shoo-in.

Now, as extinction threatens North America's natural species, more biologically oriented criteria are needed. Twenty years ago, The Nature Conservancy – a private, nonprofit organization whose motto is "Preserve the last of the least and the best of the rest" – began fashioning different criteria.

The Nature Conservancy bases its evaluations on a place's biological importance, either for saving *rare* species (and ecosystems) or for saving *many* species. If you have a million bucks to buy a nature preserve, don't blow it on a rocky mountain top that hosts only a couple of common plants. Find instead a little piece of river canyon with a population of flat-spired three-toothed land snails, or a chunk of Florida scrub oak habitat that's home to Florida scrub mint, eastern indigo snakes, Florida scrub jays, and gopher tortoises. Better still, pool your resources and buy a big enough piece of that habitat to include the genetic variety necessary to keep populations of these species around for another million years.

The business of setting conservation priorities is incredibly complicated: North America alone has more than 9 million square miles, hundreds of distinct ecosystems, and hundreds of thousands of species.

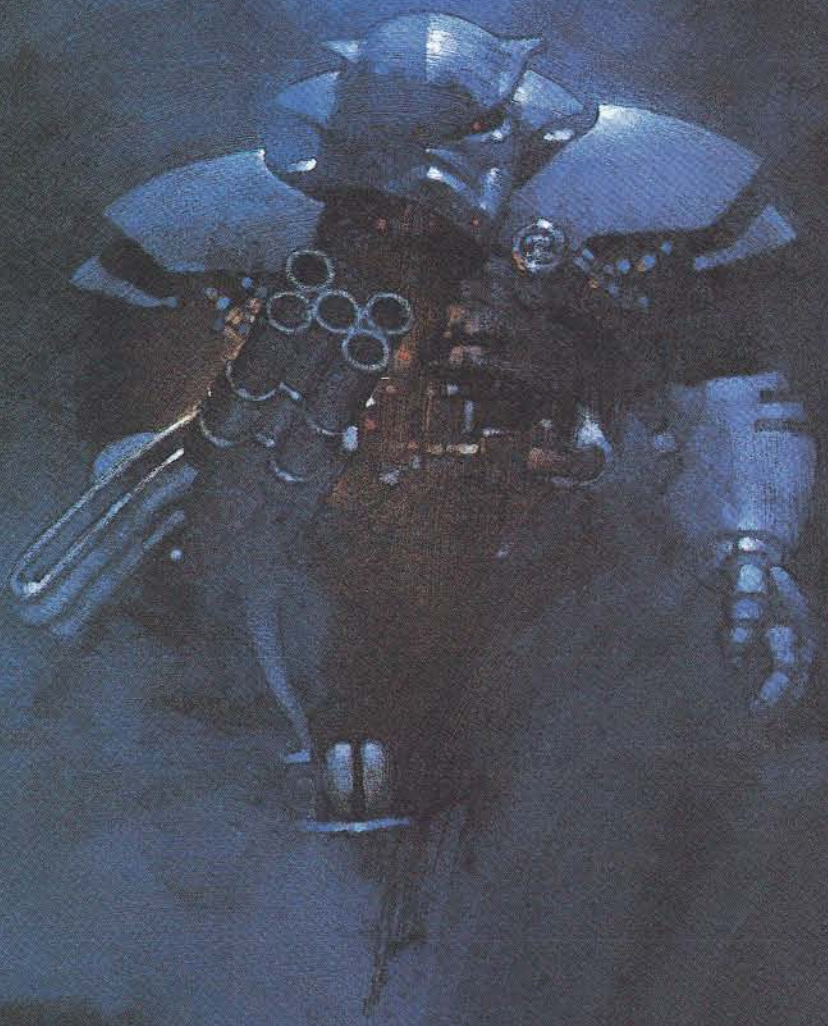
To deal with this complexity, The Nature Conservancy created The Natural Heritage Network – a hemisphere-wide community of data centers that manage computer-based data for species and ecosystems. Several Heritage programs started out as part of The Nature Conservancy; all but two of them are now run by state government land-management organizations. Together with Nature Conservancy scientists, the Natural Heritage Network compiles and manages a comprehensive library of computerized data about the world's imperiled flora and fauna.



The Natural Heritage Network: a key tool for preserving biodiversity.

The network began amassing its databases: first on punch cards, then on a collection of old HP minicomputers, and now on hundreds of PCs. The program uses The Biological and Conservation Data System (which won a *Computerworld* Smithsonian Award last June along with The Natural Heritage Network). The system manages a quarter of a million data records within each of the local Heritage data centers in 50 US states, 5 Canadian provinces,

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and 13 Latin American nations.

Each data center sends summary digital information (the legal standing of species and ecosystem types as well as appraisals of their local rarity and vulnerability) to the network's headquarters in Arlington, Virginia, where analysts search for continental and global relevance, and send out its findings to every data center that has reason to care.

"Everything's rare someplace," says the system's chief designer, Keith Carr. "But those species we're most concerned with are truly rare. Taking a broader view can help determine which species have the most acute needs. If, say, the piping plover people in Rhode Island know what's happening with the populations of an endangered bird in the Great Lakes, it may influence their conservation priorities."

Interior Secretary Bruce Babbitt plans to make Heritage's data and program the spine of his new National Biological Survey, a move environmentalists hope will mark a new era in federal conservation policy. Of course, allocations will remain political, and scenic areas teeming with animals will continue to receive the lion's share of the conservation dollar. But just in case anyone in power wants it, there is a hell of a lot of potent information and analysis at the Natural Heritage Network's fingertips about how to preserve the last of the least and the best of the rest. For information about the Nature Conservancy's database, call +1 (703) 247 3720. – *Gordy Slack*

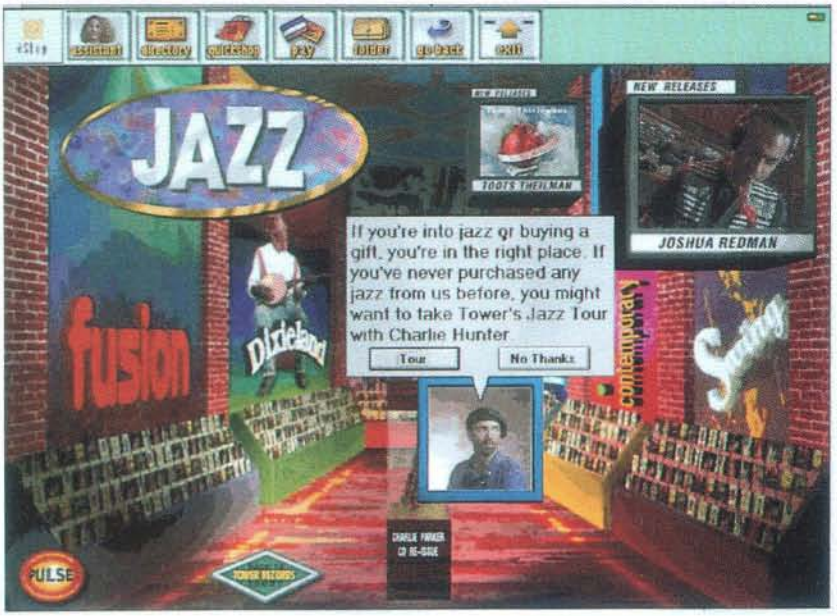
EShop Gives You the Bazaar

Ever since the days when the wandering nomad drove his camel across the desert to haggle in the oasis bazaar, shopping has involved more than just gathering necessities.

Shopping is first of all a feast of the senses. For the nomad, this meant brightly colored cloth wafting in the dust-choked air, the cries of street vendors and the braying of donkeys, the smell of smoky lamb brazing over coal. Today, we call this a compelling shopping experience.

Then, too, shopping offers the opportunity for serendipitous discovery. The nomad may think he needs only one jug of olive oil, but a merchant has a proposition. "Tell you what, my friend," he whispers confidentially. "If you buy two jugs, then you may also have this beautiful red cloth to take home for your wife." Today, we call this merchandising.

Such were the forces that pulled people into the bazaar in old days, and its attractive power remains undimmed today. But few of the digital moguls hoping to capture even a tiny fraction of the US$2 trillion plus in US retail spending have a clue as to how these underlying dynamics of shopping might work in the cyberspace bazaars of tomorrow.



EShop brings the underlying dynamics of the oasis bazaar into cyberspace.

EShop Inc. of San Mateo, California, believes it may have an answer. Its software offers electronic retailers and online services tools that enable them to creatively sell their wares, and offer digital shoppers a compelling online experience.

"So much of what is envisioned as electronic commerce is really just a scrolling list of products," says eShop's 30-year-old CEO, Matt Kursh. "That may be fine for certain things, like discount software. But that's not selling; it's taking orders. And it won't work in the mass market."

EShop has developed a multipart software system that enables merchants to custom-design the look and approach of their virtual stores, thereby offering their own branded shopping experience to consumers through online and cable services. It licenses its technology to online services as well as to merchants – 800-FLOWERS, Tower Records, and Lands' End are three early customers who will open their virtual stores this month on AT&T's new Personalink service.

Using the "eShop Builder" Windows-based graphical application, retailers can create a simulated shop with 3-D views of navigable aisles.

"There's nothing else out there that does what eShop does," observes 800-FLOWERS's Elaine Rubin. "We designed an interface oriented around various emotional occasions: click on the 'birthday party,' for instance, and you're greeted with the sights and sounds of a party, where you can see various flower arrangements appropriate to that occasion."

EShop's software contains a high-level language, ShopScript, that allows merchants to create personal shopping assistants – sales clerks – with distinct "personalities" to provide customized information and product recommendations to shoppers.

And the software provides detailed customer tracking and profiling data that allow retailers to target certain customers for specialized promotions.

"It'll tell us if a customer lingered over an item but didn't buy it," explains 800-FLOWERS's Rubin. "The next time that person enters our online store, the personal shopping assistant

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can offer the same item to that customer for 10 percent off and maybe close the sale."

What does eShop think of the privacy concerns raised by software this sophisticated?

"They're huge," concedes Kursh. "Normally we don't meddle in how merchants use our software – how they price or deliver their products, for instance. But I don't think we can abdicate our responsibilities in the privacy area. So we've built into the software a way for the consumer to shut off profiling and tracking by the merchant."

Assuming eShop technology helps transform electronic shopping into an inviting experience for the nontechnical consumer – and there are a number of venture capitalists, marketing consultants, and strategic business partners who think it will – eShop will get a percentage of the online store's revenue.

"If our technology really promotes online commerce – and we believe it will – then it's safe to say we'll do rather well," says Kursh.

No kidding. – *David Kline*

Feeding Wall Street

Good things come to those who wait, but they come first to those who pay. That's leading a host of new video-information technologies to Wall Street, where knowing something just a second before the other guy can mean a million-dollar profit.

According to market-research firm SIMBA Information Inc., the market for real-time financial data and news topped US$5.6 billion last year and will increase to $7.7 billion by 1998.



The networks want to get on your desktop.

Most of that was spent on quotes and news wire services. Walk around any trading room on Wall Street and you'll see traders at their desks, staring at screens and screens of text, while a few strategically placed televisions burble off in a corner – usually with the volume turned down.

The video is shunted aside, but it's not ignored. If something really big happens, like war breaking out in the Persian Gulf, all eyes turn to the TV, says Gary Crofton, a trader at State Street Bank & Trust Company in Boston. "There's something engaging about video that cuts through the clutter," he says.

Unless the video is important to all the traders, though, it's lost in the background. CNN and NBC hope to break out of the corner and onto every desk, courtesy of the latest networking and compression technologies.

CNN has adopted a simple strategy. In partnership with Intel Corporation, the Turner subsidiary will offer its around-the-clock programming, real-time stock-quote updates, and headlines that match the video as a PC network feed, available for a monthly fee of $10 to $12.50 per user. Instead of waiting for the crowd to turn up the volume, anyone can hone in on the broadcast independently.

NBC, which owns the business news network CNBC, has a more ambitious – and expensive – product: NBC Desktop Video. In addition to CNBC's continuous feed, the General Electric subsidiary will offer subscribers access to live, unedited footage of breaking news events, most of which never sees the light of day. It won't come cheap, though. The network plans to charge $1,750 per month for five users and more for additional screens.

NBC has harnessed MFS Communications' Datanet, a 14-city, fiber-optic web built in August 1993, that uses asynchronous transfer mode. Each customer site will connect a server to the MFS network. Each PC will access the server through a simple Windows program that controls a database of footage with VCR-style controls. The program can play full-screen video or reduce footage to the size of an icon, without requiring any special add-in cards. Users can also record the video on their PCs.

The CNN/Intel system features a less demanding setup. The lower bandwidth requirements allow CNN to send its video feed to each site via the usual coaxial cable necessary for receiving CNN on a TV.

At the site, the cable feeds into an Intel dedicated gateway. The server digitizes the video and uses an Ethernet LAN's multicasting ability to conserve bandwidth by sending a single video stream to many PCs.

Intel plans to improve its system so additional information will be available to users as they request it.

"This is only the first stage," says Steven McGeady, vice president general manager of Intel's communications technology lab. The giant chipmaker is on a jihad, he says.

"Once you have the digital signal synchronized with the video, it would be easy to put full text or other background information into the feed," McGeady says. The system could also include searching and indexing tools.

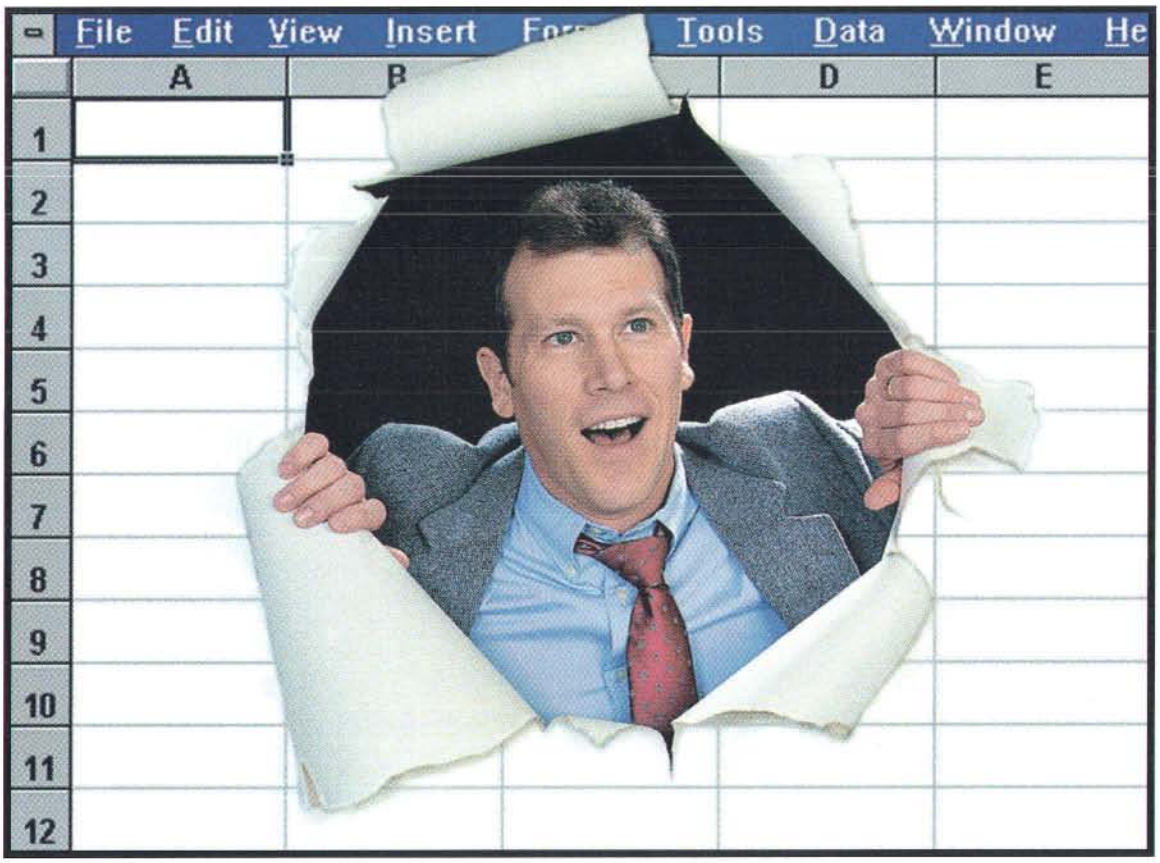


CNN at Work: news, quotes, and headlines that match the video.

After hearing the latest news, a viewer could pull up more detailed text stories or search out related investment opportunities. A video story about third-quarter earnings at Sears could lead a reader to Sears's online financial statements in the Securities and Exchange Commission database and then to a Wall Street analyst's in-depth report on the state of retail marketing.

Eventually, McGeady says, "you could turn an unstructured medium – television – into something more like Web pages." – *Aaron Pressman*

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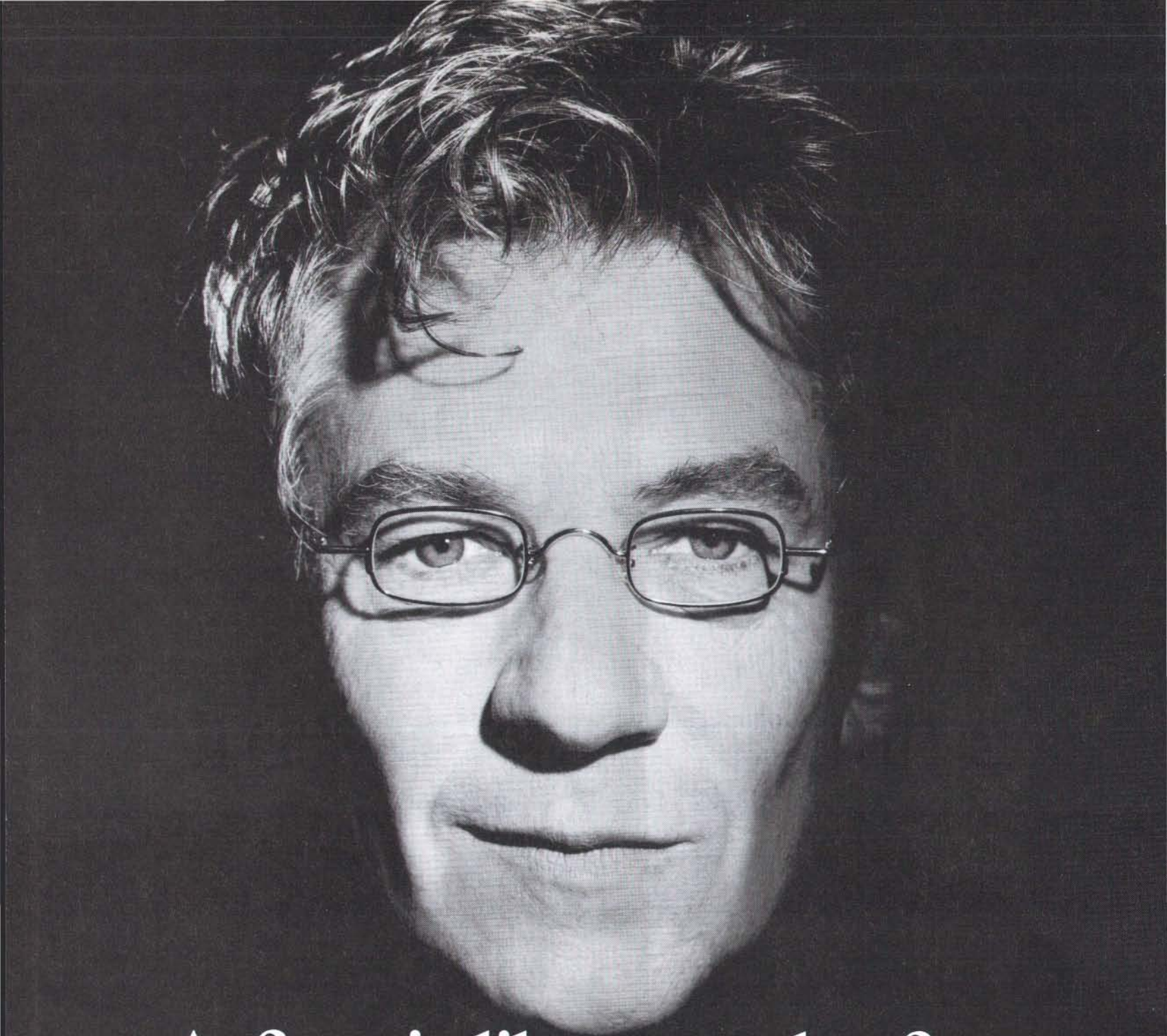
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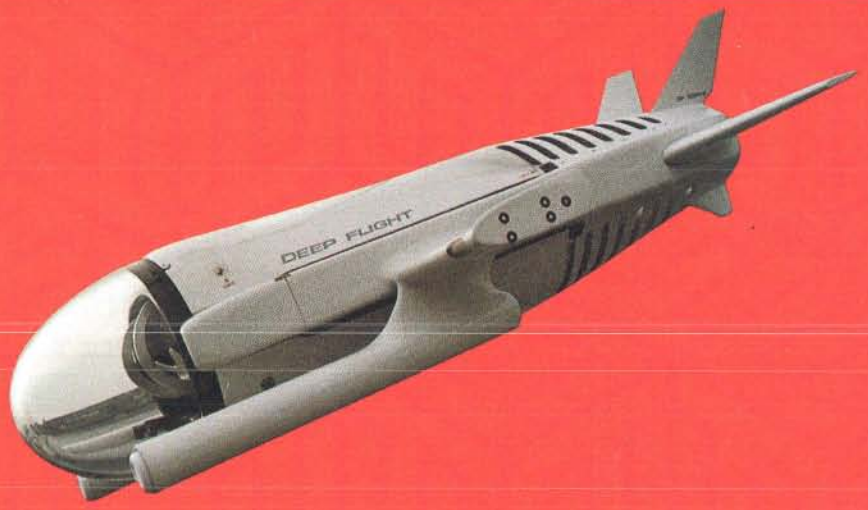
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Edited by David Jacobs



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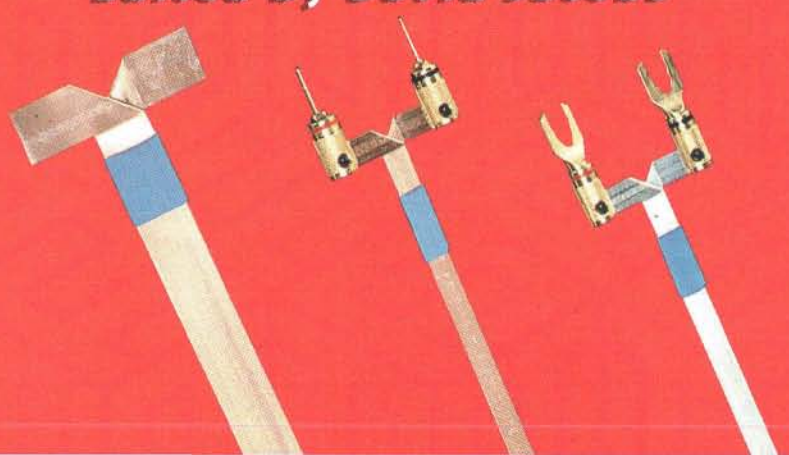
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Brain Game

Remember Simon, that beeping, blinking, battery-sucking memory game of the early '80s? Welcome to the next level. Sega's Pods is a sound- and light-emitting orb using infrared sensors and electronic eyes that respond to the motion of your hands. It's a game you don't have to touch to play. Pods features six contests combining memory exercises and hand-eye coordination that'll work parts of your brain you never knew you had. And you don't have to kill anything to win. Sega Pods: approximately US$50. Sega of America: (800) 872 7342,+1 (415) 508 2800.

Reverse Scanning

Images travel from the real world into the digital realm through scanners. Until now, the least expensive way back out has been the color printer. But now, Polaroid offers a new way to turn your pixels into pictures. The HR 6000 Digital Palette Color Film Recorder creates high-resolution film from digital art on your PC. Using dynamic focus circuitry, the HR 6000 delivers slides, prints, and chromes with 4,000 lines of resolution and 16.7 million colors. HR 6000 Digital Palette Color Film Recorder: US$5,995. Polaroid Corporations Electronic Imaging Group: (800) 816 2611, ext. 729, +1 (617) 386 2000.





Clear Out the Darkroom

Every day you hear claims of the latest "Hasselblad of digital cameras." But with the PhotoPhase or the PhotoPhase Studio Kit, you can have digital technology with a real stand-under-the-black-cloth camera. A scanning unit fits on the back of many medium format cameras and any 4-by-5-inch camera in place of the film holder. The scanner sends color images to your Macintosh, where you can work on your photographs using the included software. PhotoPhase for the 4-by-5: US$23,470 (maximum file size of 102 Mbytes); PhotoPhase Studio Kit for the 4-by-5: US$12,990 (maximum file size 25 Mbytes). PhotoPhase Inc.: +1 (415) 599 9087.

Catch Some Air

The Air 50 is the most extensively copied and tested board Burton Snowboards has ever made. Designed for all-purpose freestyle shredding, its one-piece, vertically laminated wood core has a polyethylene base and steel edges, making it perfect for spinning and fakie (backward) riding. The Air 50's rounded nose and minimal swing weight give guys and gals the flexibility and versatility necessary for all-terrain riding. Air 50 Snowboard: US$459.95. Burton Snowboards: (800) 881 3138, +1 (802) 862 4500.



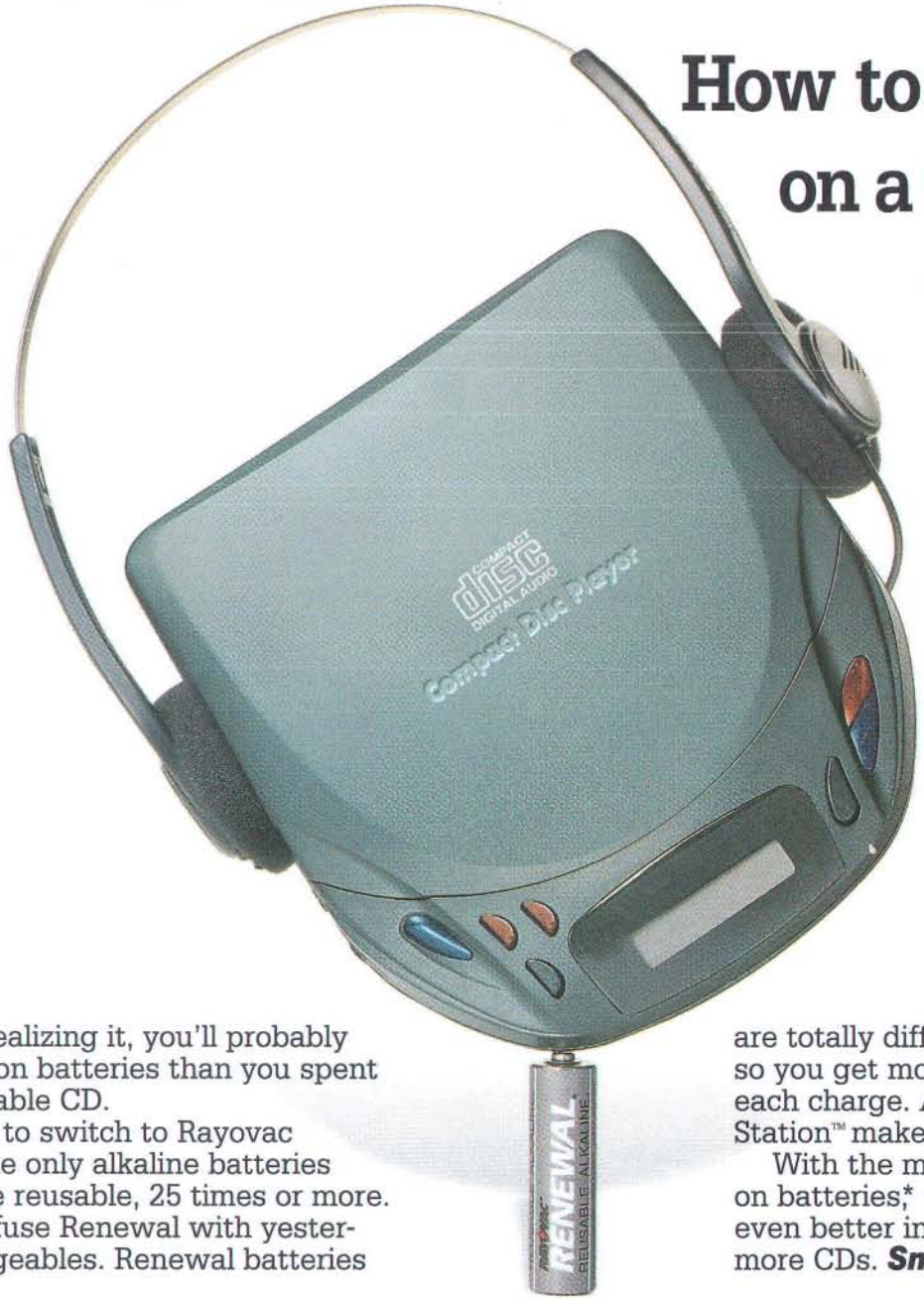
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BURTON TEAM RIDER JOE CURTES. PHOTO BY VIANNEY TISSEAU

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Speakers don't have to be big, ugly boxes to work well. The Emphasis model was designed to reduce the sound distortion and internal reflections inherent to box-enclosure speakers. These jazzy, saxophone-shaped units deliver great low-frequency response while the positioning of the metal dome tweeter provides high-frequency dispersion. Get a friend to help you move them: they weigh 77 pounds each. Emphasis loudspeakers: US$9,000 per pair, made to order. B&W Loudspeakers of America: (800) 370 3740, +1 (508) 664 2870.

Printing by the Pound

Leave it to a watchmaker to design a printer you'll actually want to carry with you while traveling. The PN60, from Citizen, is the smallest and most lightweight printer in the world. At first glance, you'll find it hard to believe this 1-pound device is a laser-quality printer. But the proof is in the thermal-fusion engine, which outputs plain paper, envelopes, labels, and transparencies at two pages per minute. You can even print in color with an optional color cartridge. PN60: US$399. Citizen America Corporation: (800) 477 4683, +1 (310) 453 0614.



Dish Out the Data

The MLink-5000 is the first land-based briefcase terminal to use an international maritime satellite for global communications. The MLink-5000 lets you phone, fax, and transmit or receive data any time, anywhere. Just unfold the flat array antenna, punch in your telephone number, and you're ready to go for up to one hour of transmitting on a single battery. The main drawback is the wimpy 2400-baud fax and data interface. MLink-5000: US$13,000. NEC America Inc.: +1 (703) 834 4150, fax +1 (703) 481 6904.

Face Mail

The Eris is a portable videoconferencing system that runs on your PC or Mac. As easy to use as a telephone, the self-contained unit includes a color camera and a database for storing the names, phone numbers, and photos of people you network with. Just click on the name or picture of the person you want to call. The Eris system connects with other videoconferencing units, works with both digital ISDN and standard phone lines, and comes in either SCSI or PCMCIA configurations. Eris Personal Video Communications System: US$5,000. RSI Systems Inc.: (800) 496 4304, +1 (612) 896 3020.

...So You Think You Know Japanese Companies?



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Video-on-Demand

You've heard the hype. We asked the experts. Here's the *real* story.

The telephone, cable, and computer companies are racing to grab a piece of the video-on-demand market, which Dataquest Inc. estimates will reach US$5.2 billion in sales by 1997. But with VOD trials being pushed back due to technical foul-ups, and evidence showing that consumers aren't willing to pay extra for these services, the future doesn't look so bright. Nobody really knows how to build a video-on-demand server, and the result has been a lot of guesswork and expensive prototypes that have yet to be tested under real-life conditions. To find out what the vendors are doing right, and what they're doing wrong, *Wired* got the specs on four video-on-demand servers and put them under several experts' critical eyes. – *David Pescovitz and Steve G. Steinberg*

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Bob Alexander	C	C-	D	B
Thomas Healey	B	B	A	A
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Thomas Healey general manager of Electronic Highway Division, Andersen Consulting Canada

Len Yencharis proprietor of The Yencharis Consulting Group, which specializes in high-technology markets

The Silicon Graphics Inc. video-server solution is the most conventional and was rated highest by the experts. The system is straightforward: multiple computers are connected to many fast hard drives. The server receives requests from users and transmits the video from hard drives to the user. While the experts think the result is solid, Healey points out that because SGI was "first out of the gate" with its VOD server, its system has also been the first to hit a performance wall.

SGI's Challenge XL server will be used for the Time Warner Cable trial in Orlando, Florida, which was scheduled to begin late in 1994 and will service a total of 4,000 homes. Customers will have a powerful set-top box, built by SGI and Scientific-Atlanta. Most experts criticized this particular set-top box for being too smart (and costly). As Alexander argues, a more efficient solution would be to "locate the 'intelligence' in the central office." By offloading more of the computational burden to the video server, dumber and cheaper set-top boxes could be used.

Oracle is trying to leverage the company's very successful database technology into the multimedia age with its Media Server. The Media Server software is really just a database that can seek and retrieve video and sound. Although the software is portable to other systems, it was designed with nCube Corp.'s Massively Parallel Processor (MPP) in mind. An MPP is a computer built of many identical processors in which each processor works independently on a piece of the problem. The result is a very powerful system, but not one well suited for video-on-demand, according to the experts we spoke to. Yencharis flatly states, "nCube is a fantasy." He argues that MPPs are too expensive and unable to handle the real-time interaction that is necessary for video-on-demand.

Nonetheless, this system is one of the few in use today – albeit on a very small scale. In the UK, British Telecom is using an nCube MPP running Oracle software to provide video-on-demand to up to 60 households.

While most vendors are building video-on-demand servers out of general-purpose computers, Hewlett-Packard is combining a standard Unix computer with custom hardware. It calls the system the Video Transfer Engine. The server's front-end computer handles mundane tasks like billing and setting up transactions while the VTE handles the transmission of video streams. Yencharis says that this should be cheaper than Oracle's answer of throwing an MPP at the problem.

Hewlett-Packard has contracts to sell its system to both Pacific Bell and BellSouth Telecommunications. PacBell is waiting for regulatory approvals before starting up in four areas of California, followed by statewide service, while BellSouth is getting ready for an 18-month trial in Atlanta in mid-1995. Not everyone is convinced that BellSouth has the resources and technical chops to pull it off – especially as it will be facing competition from cable companies in the local telecom and video markets. Alexander predicts, "Time Warner will be delivering phone service long before BellSouth figures out how to deliver movies from a Hewlett-Packard server."

Always ambitious, Microsoft wants to provide the software necessary for the entire video-on-demand market. Its continuous-media server, with the code name Tiger, is not just for giant phone and cable companies. It can also be used by small businesses, such as real estate agencies, that want to display their wares. Tiger, like Oracle's Media Server, is software that manages and transmits video. However, instead of running on one powerful computer, Tiger will operate over a network of inexpensive PCs that share the load.

Right now, according to Yencharis, "Microsoft has a paper tiger on its hands." Tiger is still in development (Microsoft says it will be out the second half of '95). Of course, lagging behind and then wresting control of a market is standard procedure for Microsoft. And, as Alexander pointed out while reviewing the four systems, "with only one exception, none of these companies has any experience or feeling for what it takes to win in the consumer media markets. The one exception is Microsoft."

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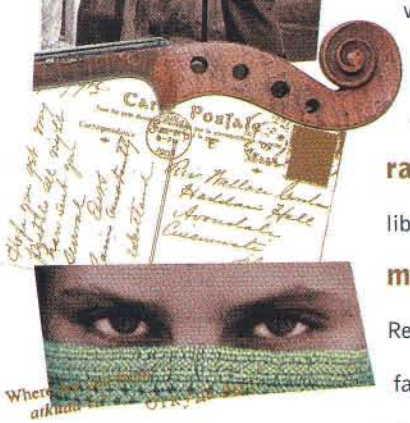
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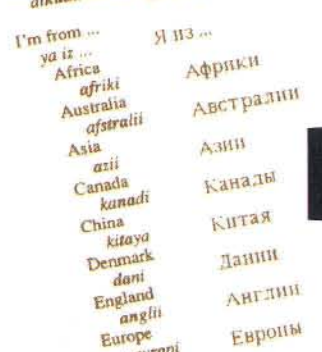


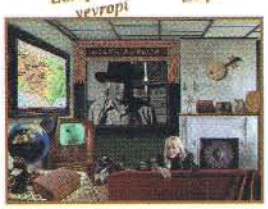
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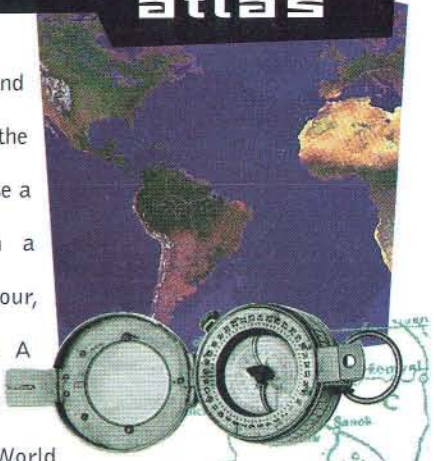
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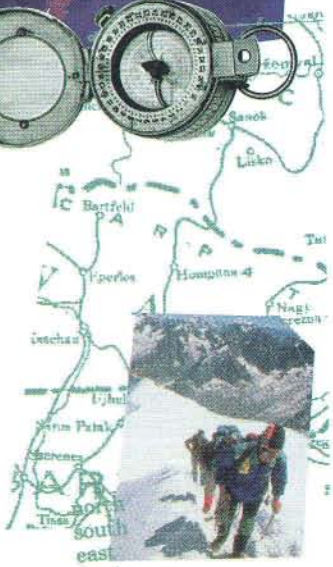






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US BIOTECH R&D

Since 1992, pharmaceutical firms have outspent biotechnology companies on scientific research. In fact, funding and strategic alliances have turned many biotech companies into research labs for pharmaceutical conglomerates.

HOME WORKERS

Thanks to technologies like fax and e-mail, the line between home and office is becoming blurred. The fastest-growing segment of "home workers," as they are now called, is telecommuters, spurred by environmental concerns and a desire to keep working while caring for children.

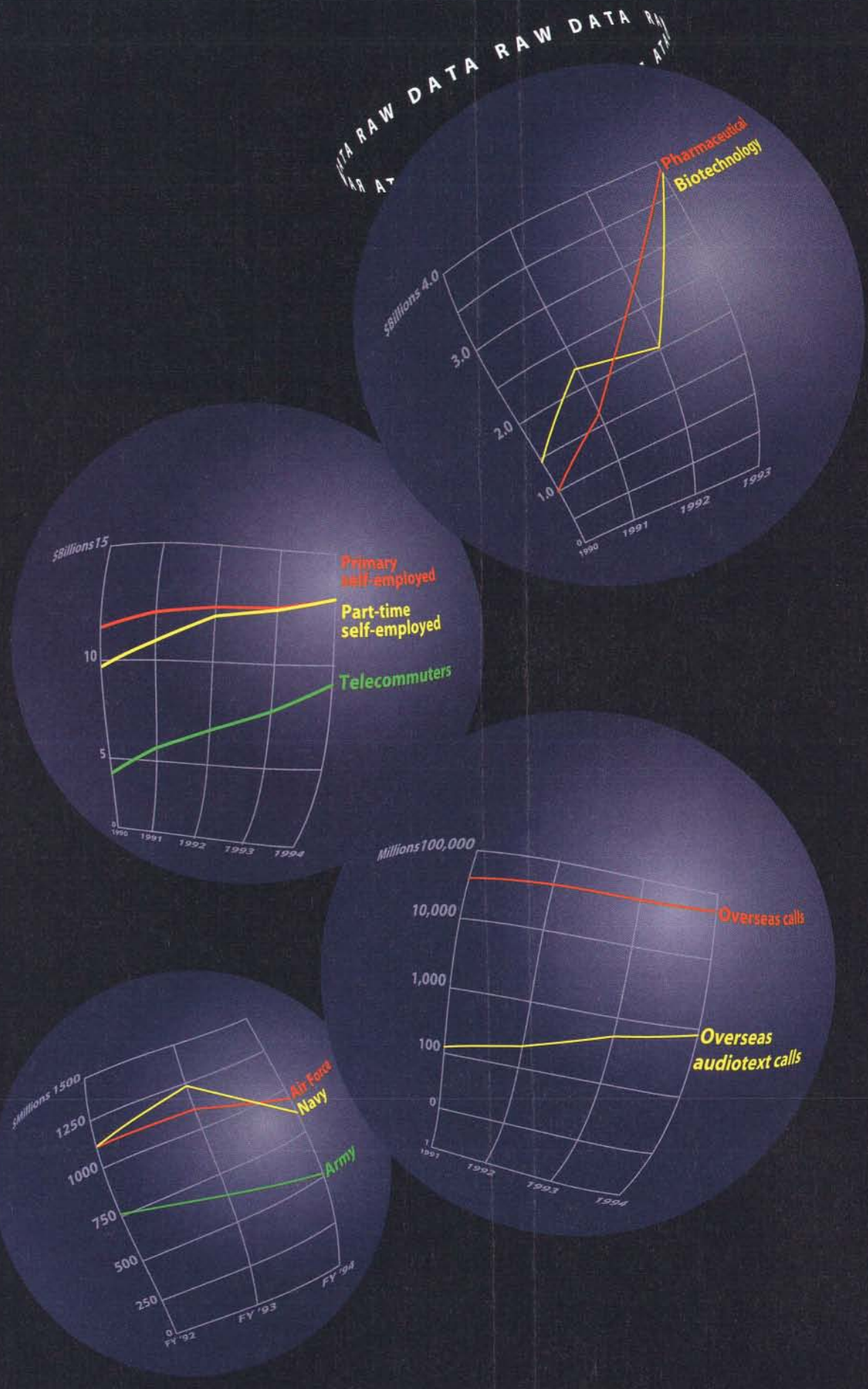
INTERNATIONAL PHONE SEX

While the number of minutes spent on overseas telephone calls increases by about 10 percent a year worldwide, minutes of overseas calls to audiotext services has quadrupled over the last three years. Regulations and economics have moved the industry offshore. Calls to taped information services – largely sex lines – now make up 2 percent of all overseas calls.

ELECTRONIC WARFARE FUNDING

The military's relentless promotion of electronic warfare hasn't shielded it from defense cuts. Last year, the Air Force was hit with a 14 percent drop in electronic warfare spending. So defense contractors are selling their technologies overseas – a trend that may come back to haunt the US.

– Steve G. Steinberg



SOURCES: TELEGEOGRAPHY, INSTITUTE FOR BIOTECHNOLOGY INFORMATION, LINK RESOURCES CORP., FROST AND SULLIVAN
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Stochastic Screening

Will this new technology

Since the turn of the century, photographic images have been printed using the same technique. Called halftoning, it converts shades of gray into small black-and-white dots arranged on a grid. Different shades of gray are simulated by adjusting the dot size and the density of the grid. We have become inured to this approximation, perhaps only noticing it in grainy newspaper images.

But a new technique promises to improve images and allow photographs to be printed with more than the usual four colors. This technique – stochastic screening – could be to halftones what HDTV is to traditional TV. Stochastic – from the Greek word *stochos*, meaning a guess – refers to a probabilistic method for describing how complex processes behave on average. It's a tool often used in nuclear physics and weather forecasting. Stochastic screening works by defining the desired average outcome for a defined area, then relying on the rules of statistics and probability for the precise arrangement of dots. Many of the problems with halftones are eliminated, although some new ones are introduced.

The biggest problem with traditional halftones has always been the presence of repeating light and dark fringes, called moirés, caused by interfering grids of halftone dots. For example, take a photograph of a fabric with a texture similar to that of the halftone pattern. Regions where the two textures align will print lighter than areas where they don't.

Another potential moiré happens with color images. Color printing is made by separating an image into its component colors, then printing each of the separations in sequence. If the grids of the different overlapping color layers interfere, there will be moirés. But back in the '30s, when color printing was the hot new technology, inventor Alexander Murray found that if the grids for the three main ink colors (cyan, magenta, and black – yellow is too weak to matter) are rotated 60 degrees from each other, the moiré disappears. This compromise works well only with three strong colors.

While halftoning uses a straightforward, deterministic translation scheme – each input level of gray matches a corresponding dot size and position – stochastic screening employs mathematical uncertainties. Depending on the type of stochastic screening used, dots of ink can vary in size, frequency, or even shape. What characterizes a stochastic process is that the magnitude of that variable is not set in stone, but left up to a probability.

In a simple frequency-modulated stochastic scheme, for example, a dark gray is represented by a region in which each pixel has a 70 percent probability of being turned on. So for each pixel, a number between one and ten is randomly chosen, and if the result is less than eight, the pixel is turned on. Which pixels are turned on will vary from print run to print run: only the average result is predictable. But this simple method can result in patterns or clumps by chance. So sophisticated – and proprietary – methods have been developed to "filter" the randomness so no such artifacts emerge.

Raph Levien (raph@netcom.com) *is a grad student at the University of California, Berkeley. He likes to play with dots.*



Halftoning converts shades of gray or color into small dots arranged on a grid, as is made obvious in this detail, enlarged eight times. Typically, though, we have become inured to the approximations of halftoning.

replace halftones in printing? By Raph Levien

Some methods also examine the status of surrounding pixels to determine whether a pixel should be turned on, but this sharply increases the computational complexity of the method.

When they're done right, stochastic images can put their halftone equivalents to shame. Moiré is eliminated, and thanks to the small size of the dots, images look more photographic. Additional inks ("hi-fi color") can make the colors stunning. Stochastic screening also does not require most users to change their routines. Only the software inside the image setter – the RIP – is different, so most users will notice only slower RIP times and increased image quality. But professional printers will need to be aware of the screening method used so they can adjust their routines accordingly.

If stochastic screening is so great, why isn't it used for all printing? Unfortunately, each troublesome artifact in traditional screening is matched by a similar problem with stochastic screening. The bane of stochastic screening is the tight control needed over the printing process. After an image leaves the pure digital world, it enters the messy world of film processing. Any variation in film processes can transform the final result. Producing tiny dots is the most challenging aspect of printing – the coarser dots of halftones tend to be much more forgiving. The most successful adopters of stochastic screening have been printers who already tightly control the printing process.

Another downfall is that stochastic screening gives flat tints a somewhat grainy appearance because of imperfections in the way dots are transferred to paper. In a halftone, the regular arrangement of the dots ensures that printing imperfections affect each dot in the same way. But a stochastic screen scatters and clumps the dots randomly, so some dots are more affected than others. However, if the printing is done well, these imperfections are minimal.

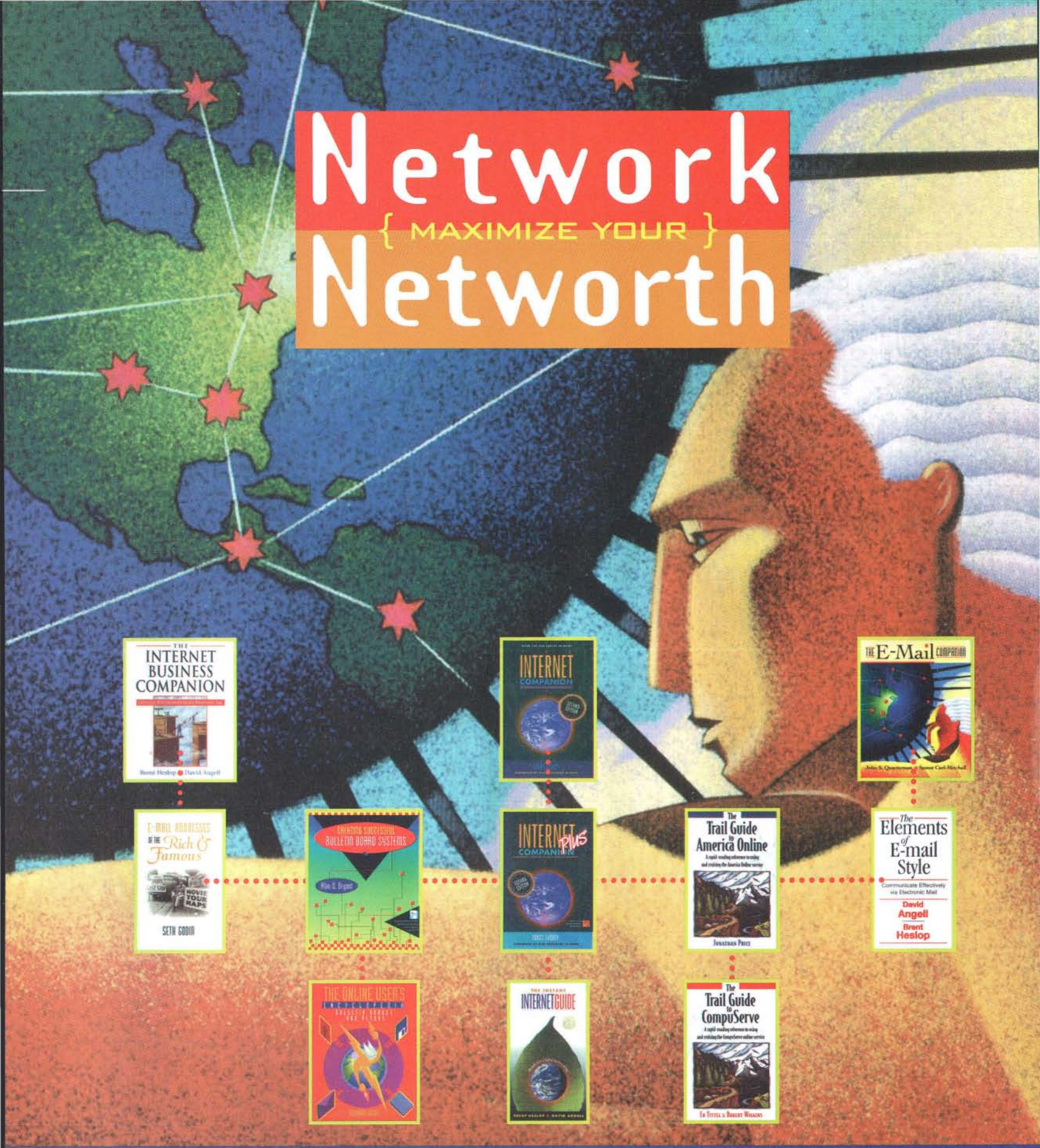
Stochastic screening also sacrifices the simple, deterministic relationship between dot size and color found in traditional halftones. Just as larger halftone dots lead to darker grays in black-and-white printing, in color printing, larger dots lead to deeper color shades. Because of the deterministic relationship, if you make the dot size this much bigger, you invariably get that much color shift. With stochastic screens, the relationship between dot spacing and color is much more difficult to control.

According to Don Carli, founder of Nima Hunter Inc., and inventor of the term "stochastic screening," techniques exist to solve these problems. Ultimately, he sees screening as a form of binary *feng shui*, in which, aided by probabilistic analysis, the interaction of each individual dot with its context combines to produce exactly the desired effect. The viability of this approach – in his words, of "jujitsu versus brute force pugilism" – relies on dropping prices and exponential improvements in microprocessors.

As with any new technology, the early hype about stochastic screening – that it would cut press waste and allow lower resolution scans – hasn't completely panned out. Indeed, stochastic techniques may never replace traditional halftones. At the very least, the beautiful work stochastic screening produces will ensure it a solid niche. ■ ■ ■



When they're done right, stochastic images like this one, also enlarged eight times in the detail, put their halftone equivalents to shame. Moiré is eliminated, and the small size of the dots makes images look more photographic.



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alt.sex.academic.freedom



The only perversion on the Carnegie Mellon campus is the administration's rape of academic freedom.

By Mike Godwin

Excerpted from a speech Mike Godwin gave last November at Carnegie Mellon University, which recently banned several Usenet newsgroups from campus computers.

For the first time in history, we have a many-to-many medium where you don't have to be rich to have access, and where you don't have to win the approval of an editor or publisher to speak your mind publicly. Usenet and the Internet, as part of this new medium, hold the promise of guaranteeing that the First Amendment's protection of freedom of the press means as much to each individual as to Time Warner or *The New York Times*.

The US Supreme Court has long held that, at least in theory, freedom of the press applies as much to "the lonely pamphleteer" as it does to the editors of a major urban daily newspaper. But the Net puts this theory into practice. And it is precisely because the Net holds the promise of being the most democratizing communications medium in the history of the planet that it is vital we prevent the fearful and the ignorant from attempting to control your access to it.

Which is what is happening here at Carnegie Mellon. There is a strong sense here that Carnegie Mellon must protect you from yourselves. The university claims that if it doesn't cut off access to these newsgroups, for everyone on campus, it will not only risk perverting you by exposing you to sexually oriented materials, but it will also be legally liable.

The claims are wrong. First of all, it's not true that the *only* way to prevent minors from gaining access to this material is to deny *everyone* access to it. It is clear to me that the administrators haven't explored any alternatives other than the most expensive and infeasible.

Secondly, there is little if any risk of legal liability for the university. As Usenet is so large, no one can be presumed to have knowledge of all the content of Net traffic; without proof of that knowledge, says the Supreme Court, there can be no liability. No university anywhere in the country has ever, at any time, been held liable to any degree for carrying the alt.sex newsgroups.

Third, the risk that the 17-year-olds who enter this university as freshmen are unfamiliar with the materials that are carried in these newsgroups is exceedingly low. I submit that if any entering freshmen haven't encountered material that deals with human sexuality before now, then Carnegie Mellon has an affirmative duty to expose them to it.

I was told by attorney Jackie Koscelnik of the university's legal office, "So what if the risk is low! We don't want to be a test case!" To which I respond: Carnegie Mellon, your lawyers have forgotten the meaning of the Constitution they have sworn to uphold.

Indeed, it's ironic that an institution that focuses so much on memory – of our sciences, our knowledge, our traditions, our values – has displayed so much forgetfulness about the meaning of a university.

They want you to remember the meaning of the Periodic Table, but they want you to forget that the chemistry between lovers is one of the most beautiful things we know. They want you to remember the poetry of Dante and Shakespeare and Shelley, but they want you to forget that human sexuality, which often inspired these poets, is equally the inspiration of those who write stories and poems for rec.arts.erotica.

And Carnegie Mellon has forgotten that the Constitution presumptively protects speech and expression about sexual matters, even when that speech and expression may be offensive. It's been forgotten that the Constitution does not allow governments to ban sexual expression for adults merely because there is some risk that children might see it. And it's been forgotten that, when it comes to the Bill of Rights, what you don't use, you lose. The First Amendment is a terrible thing to waste.

I strongly suspect that the real reason the administration tried to yank these newsgroups is that it is embarrassed by them. If the university lacks courage, it's up to you to supply it.

This morning I spoke with Erwin Steinberg, a member of the administration who told me at least twice during our talk that he is a teacher and admirer of James Joyce's *Ulysses* – also one of my very favorite books – so he therefore understands the issues raised when someone tries to ban works based on their purported obscenity. When I heard this from him, I felt sad – how could he possibly have missed the lessons we learned in this society when books like *Ulysses* were litigated in the courts?

It's very easy, I think, to proclaim that you understand the issue of obscenity because you're willing to defend a book that was vindicated half a century ago.

What he doesn't seem to realize is that *this* fight – the fight for online freedom of speech – is the one that matters now. ■ ■ ■

Mike Godwin (mnemonic@eff.org) *is online counsel for the Electronic Frontier Foundation.*

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A comedy for the 1990s

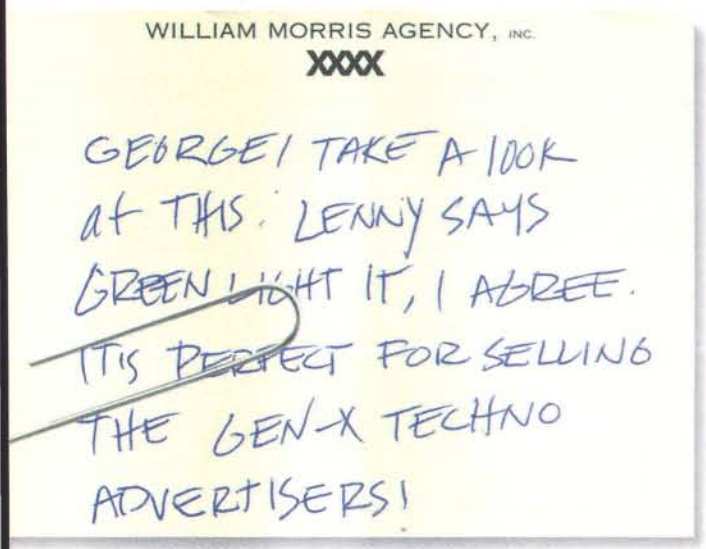


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Ever wonder what a cyber-sitcom might be like? Wanna turn to TV for something really hilarious and up-to-date? Take a look at this treatment....

Part of each show is split-screen: the audience sees the girls lounging in their ergonomically correct chairs as they type on the computer screen. The online format allows ample venues for guest stars, much as on *Hotel* or *The Love Boat*: different characters met online can be brought on for F2F encounters. What's more, computer and communications hotshots are dying to go mainstream, so would be eager to play walk-on roles – for example, JOHN MALONE might be persuaded to appear in an episode in which our heroines are having trouble with their cable! He would appear as the concerned, quality-conscious CEO that he undoubtedly wants to project to mainstream America.

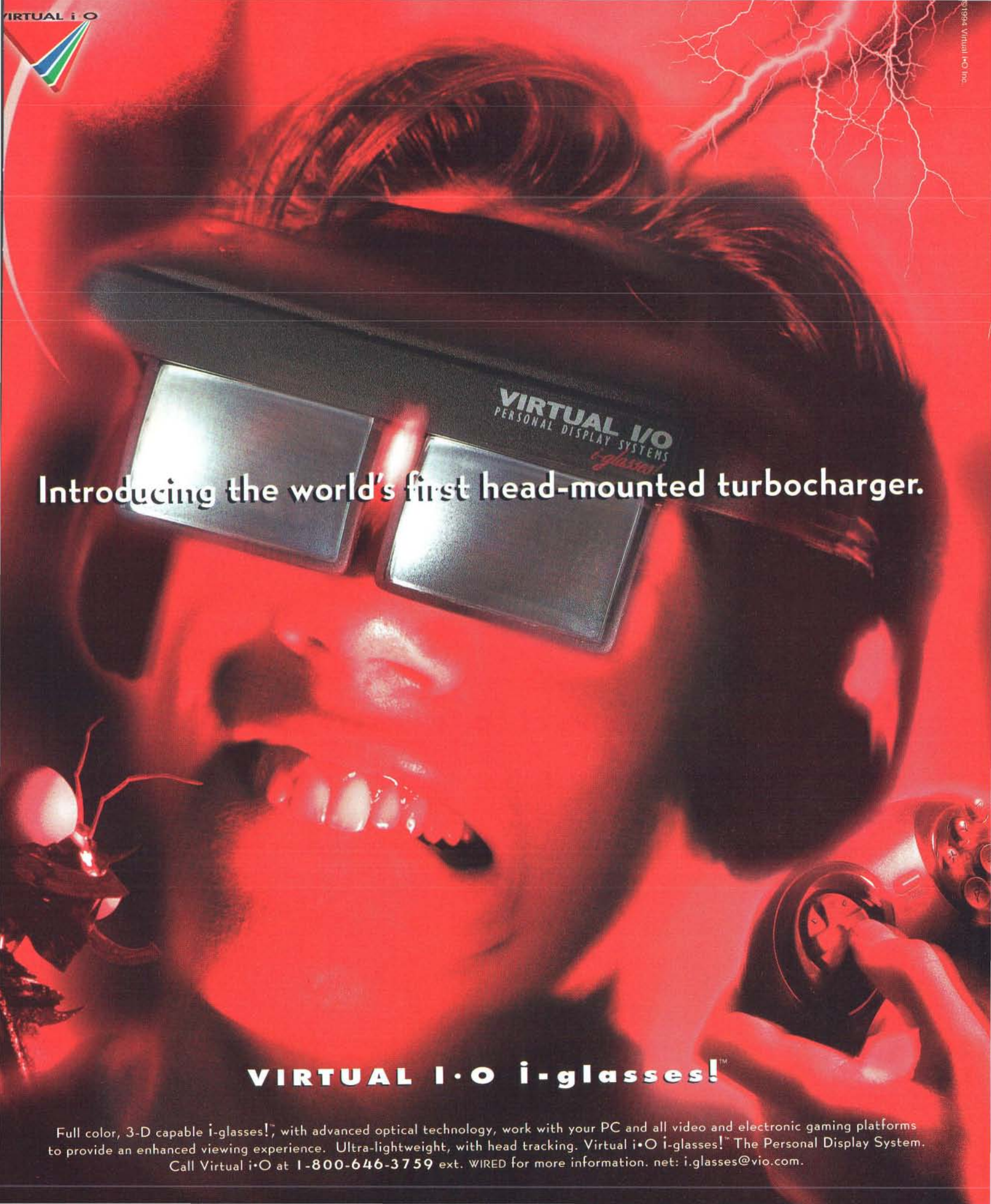
The Setup:
Two of three episodically recurring characters (VICTORIA, BOBBY) communicate with our lead characters by e-mail at the beginning and end of each episode. Both BOBBY and VICTORIA are out of town most of the time (BOBBY lives in LA, VICTORIA is a traveling salesperson), so there are ample opportunities for location cameos, say, showing BOBBY going online from the deck of a beach house in Malibu, tableside at a celebrity-chef restaurant, or VICTORIA communicating from the slopes at Alta, the United Airlines Red Carpet Club lounge in Seattle, or the Knowledge Systems Lab at Stanford.

These logins and logouts can be topical jokes, as in a Johnny Carson monologue, insider computer quips ("Q: What is the information superhighway? A: It's just like the Internet, except it's more expensive and there's a commercial break every 10 minutes," or "How many Newtons does it take to change a light bulb? Foux! There to eat lemons, axe gravy soup!") or merely slice-of-life vignettes that help foster the relationships between our characters and develop the audience's investment in them.

Interstitial Fun:
The segue to each commercial would be a 15- to 30-second Cyberpunk Moment™, which could be a jump-cut, for example, to VICTORIA hiking down the steep path to Lake Tahoe's pristine, pastoral Emerald Bay, only to arrive at a pay phone emblazoned with an MCI decal; BOBBY driving in his rehabbed 1966 Mustang convertible, glancing up at a record store marquee that lists "Software/Videos/Laser Discs;" RIMBAUD flipping out his PDA to write down the phone number of a woman he's obviously just picked up; or an item torn from a newspaper announcing Pizza Hut's new Net address. Cyberpunk Moments™ can also be brief dystopian glimpses: a newspaper headline about the death of a species, a press release for a product too awful or silly or wasteful to exist, anything that concerned Gen-X kids might care about.

Viewers would be invited at the end of every show to send in their own logins and logouts or Cyberpunk Moments™. Materials would be considered only if they are recieved through the show's e-mail address.

Lead Characters:
ALICE: A tall, strawberry-blonde, all-American beauty who escaped from her Iowa farm upbringing into the thrills of Big City living and computer high jinks! Works as a Mac systems analyst for a breast-cancer research center. ALICE got a gymnastics scholarship to Stanford, where, because of a growth spurt, she became too tall to compete. From a Mennonite family, she has a tremendous fascination with her Russian ancestors and all things Russian. And growing up as a religious minority,


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she has great sympathy for the underdog. She first got into computers through a work-study job cataloging dissident materials newly available (because of the fall of the Soviet Union) to the West. Her great love is a former Sovietologist now in residence at the Hoover Institute; they parted over politics.

XENIA: Her roommate, from a broken family. A rebel girl who traveled far and wide as a teenager and has somewhat settled down. XENIA is exotic-looking rather than beautiful, and dresses with theatrical flair and thrift-shop aplomb. She freelances in desktop publishing. XENIA came from a dying New England mill town, where her divorced, lapsed-Catholic parents drank too much. XENIA got into desktop publishing when helping put out a magazine for the local women's bookstore. Typical of XENIA's pluck, she worked a full-time shift at a local oatmeal-cookie factory in college to pay for a trip to Prague. XENIA took her name from Exene, the '70s punk singer; her real name is Mary-Josephine, reflecting her French-Portuguese-Polish ancestry. She met ALICE at a Surfrider Foundation event. XENIA is also an NRA-certified firearms instructor and has survivalist friends. XENIA is the Mork to ALICE's Mindy.

Their Two Best Friends:
RIMBAUD: A tall, lean, dark, hacker/cracker/slacker cyberpunk crown prince who wears leather jackets and has unrelenting seductive powers over women owing in no small part to his Lord Byron aura. Disappears for months at a time to backpack in Ladakh; makes his money doing security consulting for business computer systems. RIMBAUD's real name is Martin Rimbaud Poole; his parents gave him the middle name because he was conceived on a trip to Paris when they were seeking the site of Le Bateau Ivre. RIMBAUD makes the local, smoke-free espresso joint, Café Pugiliste, his informal situation room, hanging out for hours on end with his macchiatos, PowerBook, and Skytel pager. RIMBAUD has an ill-tempered corgi named PIXIE, of whom no one dares make fun. PIXIE rides in the sidecar of RIMBAUD's BSA 450. RIMBAUD grew up in Westport, Connecticut, and maintains he went to Brown only because of its semiotics program – though he spent more time on the computer science department's ray-tracer programs than reading Luce Irigaray. RIMBAUD is a Fonz for the '90s.

XENIA and RIMBAUD had a brief fling before the show starts: the first time he stood her up on a Saturday night, she cut it off. (She's been around.) RIMBAUD still insists that he was called away on an urgent computer-security break-in: they still bicker about it, years later.

HOWARD: Their geeky friend. The one the roommates call when their computers crash. Shy, sweet, spacey, with no fashion sense whatsoever, he works for a software start-up so secret and exclusive it won't even say what it's about. HOWARD has a secret online identity, the LAIRD OF MORDOR, who is the most dazzling, elusive warlord ever to stalk the realms of MUDs and MOOs. The LAIRD OF MORDOR is the only computer avatar who has consistently bested RIMBAUD, yet RIMBAUD has no idea that the self-effacing nerd his pals ALICE and XENIA hang out with is his archrival and better. No one in HOWARD's large family has any idea how he ended up such a computer genius, breaking into NORAD before he hit puberty. HOWARD grew up in rural Pennsylvania and attended the same small four-year college where his parents met. Never thinking to cross state lines, he ended up at Carnegie Mellon for graduate school, from which he was recruited by the Media Lab, Xerox PARC, Interval Research, Microsoft Advanced Technology Group, Bell Labs, and SRI International. Instead, he chose to work for Universal Galactic, the software company so cool no one knows what it does.

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Regular Minor Characters:
ROSE: Their other nerd friend. Moon-faced, pudgy, sweet, ROSE has been smart enough in her snooping through cyberspace to suspect that HOWARD may indeed be the LAIRD OF MORDOR. She's noticed that she never sees them at the same time and place on the Net and that they share similar ways with aliases and HTML programming styles. How-

ever, she has a crush on HOWARD, and is not sure how to confront him with her suspicions. ROSE helps maintain the Net node at the local university, and hints at interests in goddess worship and consensual S/M.

CLAUDE: Their kindly landlord, the grandfather figure to the group. Though CLAUDE worked in crypto during World War II (and will never talk about his exploits), he has had little contact with technology since. He is in awe of his "girls," as he calls them, and their genius with computers, but on some level, he doesn't understand all that ALICE and XENIA can do at their turbo workstations. CLAUDE has retired to this West Coast town after a career on Wall Street, leaving just as the quants were taking over. CLAUDE is a stand-in for the audience's confusion about but appreciative awe for cutting-edge technology. He is the girls' straight man: he often remarks on their ever-increasing phone lines, their need to have their machines on a circuit separate from the refrigerator, and the strange magazines they receive (*Mondo 2000, Fringeware Review, Wired, Future Sex, Yellow Silk, Anything That Moves*, and the Loompanics catalog).

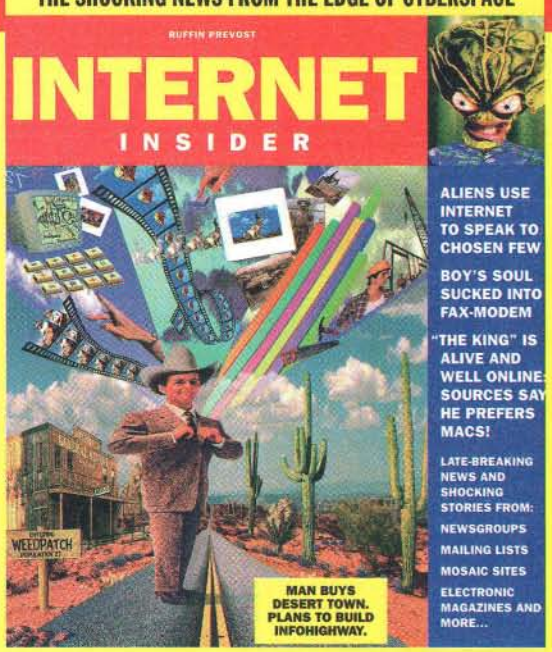
JEREMY: A burned-out Vietnam vet who lives next door. He works as a landscape architect because it is a peaceful occupation and causes no harm to other sentient beings. Because of his experience in the war with electronic surveillance, smart bombs, and other nasty technologies he won't talk about, he is skeptical of the girls' activities and believes no good can come of it. Nonetheless, JEREMY has the loyalty and ferocity of a German shepherd.

PEGGY: Lives in the basement apartment with her baby and husband, a technician laid off from the defense-aerospace industry. We never see CURT, because he has taken to driving long-haul routes for a non-union toxic-waste company. PEGGY wants to befriend the girls at the girl-talk level, tries to set them up with CURT's buddies, and offers to give them a discount at a nail salon her cousin operates – not realizing that long nails are death for Computer Gurlz. Peggy is self-deprecating, feels at once sheepish and defensive that she is home with her infant, yet is frightened of moving out of her world. PEGGY has been known to ask our girls why it is that if they work in an industry where the men so outnumber the women, they are not married off yet.

Episodically Recurring Characters:
BOBBY: HOWARD's college roommate. He ended up at Edinburg College because he was desperate to get away from his overbearing Staten Island Jewish parents and get closer to cows. (Because he was a smart boy who spent a bit too much time in video arcades, Edinburg was the only suitable place he could get a scholarship.) After college, BOBBY moved to San Francisco and came out of the closet. After being kicked out of an Act Up direct-action meeting because he couldn't stop cracking jokes, he retreated into himself; within three months, he came up with an idea for a computer game based on his career as a bicycle messenger (*Street Bomba*, with extra points for attending Critical Mass rallies and cutting off BMWs making illegal left turns) that netted him hundreds of thousands of dollars. BOBBY later moved to LA, where he is now vice president of A&R for the US affiliate of a Japanese electronics firm. BOBBY misses his simpler days of cruising the

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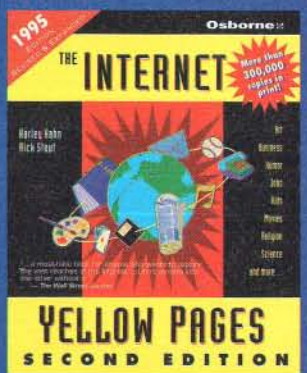
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OSBORNE

Castro and grooving on voluntary poverty and outrageous non-assimilationist gay politics. He's torn between vocally trying to sell gays to middle America ("Gay guys and their Weber barbecues!") and thinking he should stay where he is to keep acquiring the money to quietly support friends dying of AIDS. Worse luck for him, BOBBY is so damned successful at developing multimedia-content ideas that sell (his own or others), he can't leave Hollywood. So, he flies up to visit his pals at least once a month. Think of BOBBY as our man from Silliwood, an updated version of the Billy Crystal character from *Soap*.

VICTORIA: Regional sales manager for Xerox high-end imaging products. Originally from North Carolina, she is a striking, green-eyed woman of mixed Cherokee-French-Gullah ancestry who reeks of a proper upbringing. VICTORIA attended the University of Rochester, majoring in special ed for the hearing-impaired – her beloved younger brother was born deaf. In Rochester, though, she was recruited by Xerox's minority management-training program. VICTORIA and ALICE met at a Brazilian Capoeira ethno-aerobics class, and discovered a common love of pesto pizza. Before the series began, VICTORIA and ALICE were roommates; VICTORIA moved out to live with ARNELL, a graduate student in social work she met at a Buppie ski weekend. Alas, ARNELL later took a job he couldn't refuse: head of counseling at an Idaho ranch for inner-city kids routed away from juvie and into wholesome country living. The job lets ARNELL be nearer to his daughter LISHA, who lives with her mother in Montana. ARNELL and VICTORIA still make occasional efforts to cope with their own personal two-body problem. VICTORIA is aghast at outrageous XENIA, her replacement in the household, who can't help twitting the ladylike VICTORIA.

ANA: A Southern California-born Japanese-American textile designer who has worked with traditional and natural materials and techniques years before such things became fashionable. She is annoyed at how automation is affecting her business, for while ANA's customers (élite hotels and Manhattan interior design firms) are mad for the work of this sole proprietor, they increasingly cannot understand why her studio's products are, say, not distributable on disk. ANA and XENIA met rummaging through the remnant bins at Britex Fabrics, where XENIA was searching for materials for an opera cloak to wear to the 30th birthday party of one of her Goth friends. ANA is a woman of effortless and distinctive chic à la Adelle Lutz, and is idolized by XENIA.

Episodes:

- ALICE gets e-mail from her high-school basketball player ex-boyfriend STANLEY, from whom she hasn't heard in 20 years! The same day, XENIA gets e-mail from her college girlfriend, SYDNEY, whom she met at a Take Back the Night march in Northampton, Massachusetts. What do our girls do?
- XENIA is caught reading alt.child.torture. How embarrassing!
- ALICE and XENIA end up in a MOO with both RIMBAUD and the LAIRD OF MORDOR. The girls try to come to the rescue of their friend RIMBAUD, but the LAIRD outwits them all.
- ALICE is ticked off because she can't configure her new Pentium, and she's in a panic because she's been invited to participate in an élite, real-time conference deconstructing teledildonics – and it starts in 15 minutes! Fortunately HOWARD's available to help, but ALICE doesn't want her seemingly uncool buddy hanging around once the e-gabbing begins. How can she get him to leave without hurting his feelings?
- RIMBAUD falls in love with a command-line cowgirl, a hired gun brought in on a secure fiber-bypass project where he's billing major bucks. NANCY is from the backwoods, where her first computer was an overlooked Kaypro from a shipment of orphaned machines sent to rural schools. With little access to parts and expertise, NANCY has become a total, can-do genius. RIMBAUD thinks he can impress this down-home pistol of a programmer with his GUIs and shell scripts, but NANCY decides he is a puffball poseur and falls instead for a phone-line repairman who lost his job in a downsizing and whom she met teaching an ATM training

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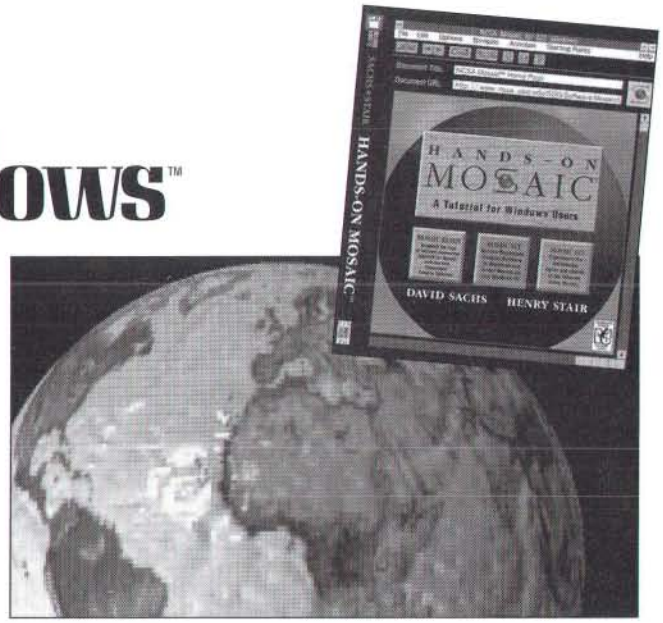
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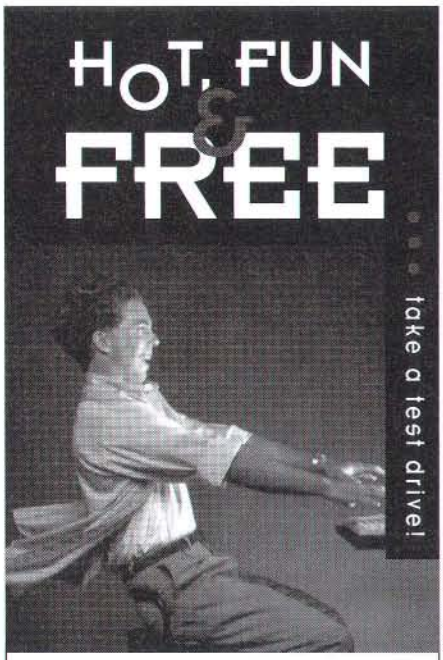
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workshop for workers made redundant by Signaling System 7. She is smitten with this man who is really good with hardware and knows how to work with his hands.

- RIMBAUD asks ANA out on a date. Things are going great until he offers to demo Aldus Freehand for her!
- HOWARD falls for JEANINE, an airy ethnomusicologist brought in to do human-factors consulting at Universal Galactic. Despite the attention she pays him, she blows him off when her contract is up. HOWARD seeks consolation in loyal ROSE, who is, of course, a much better match for him. But HOWARD sees her merely as one of the boys. ROSE, meanwhile, is dismayed to discover that the luthier HOWARD was so enamored of didn't even know how to send a fax!
- Attack of the Flesh-Eating Andromeda-Strain Trojan Horse Worm Viruses! HOWARD accidentally releases diseased intelligent agents into the Net. Showing up unexpectedly at the girls' apartment with two pizzas and three six-packs of Jolt, he orders them to turn off their computers with nervous urgency. But it's too late: the agents get out of control and into his friends' computers!
- ALICE gets into a flame war with OLIVER STONE on America Online!
- VICTORIA and ALICE are online. The news is that ARNELL's daughter LISHA has created striking but disturbing images using Photostyler on her school's Mac IIcx and mailed them to VICTORIA via Prodigy. VICTORIA is torn between showing the images to ARNELL, or respecting LISHA's privacy and keeping them to herself. Moral quandary! ALICE tells XENIA about it, and XENIA suggests printing the images at a local service bureau and showing them to a gallery owner she knows. VICTORIA is horrified, and they argue; both women say they have LISHA's best interests at heart.
- A Russian genius software programmer whom ALICE meets on the Internet wants to come stay with the girls! And on the weekend he is due to arrive, XENIA's mother, who still thinks of Russians as Godless Commie Bastards, is planning to pay a visit!
- Techno-celebrity ESTHER DYSON visits the girls because of their shared interest in software – and kooky Russian programmers!
- RIMBAUD is interviewed by Scottish babe ALISON for a joint ITV/Discovery Channel documentary on RBOCs in Hollywood, called "From LATAs to Lattes." ALISON is thrilled with RIMBAUD's insider knowledge of multimedia convergence on the infobahn, and it looks like she's in love!
- Oops! XENIA's Modern Primitives dist list and Object-Oriented Primitives dist list accidentally get linked on her hard disk. A hilarious mix-up ensues!
- Uh-oh! Federal agents pay a visit to our girls because of erroneous tips about XENIA's expertise with guns and love of paint-ball war games! JEREMY, recognizing a narc car when he sees one, comes to the girls' rescue – but not before RIMBAUD scrambles the signals coming into the feds' cell phones and all the data on their laptops! PIXIE gets into the act with some serious barking, scratching, and nipping, and it takes some doing to unscramble the confusion.
- On a trip north to attend a Digital Queers benefit, BOBBY meets a hunky guy, BRIAN, who writes optimizing compilers for SGI and collects Star Trek slash memorabilia. But the affair is nipped in the bud when BOBBY finds out that the hunk is obsessed with a *Howard the Duck* game that he plays endlessly on his beloved Packard Bell! What's more, BRIAN has a redwood burl coffee table and likes Billy Joel!
- XENIA decides to help her Adult Children of Alcoholics home meeting compile a phone tree, but runs into problems when her database program won't override the last-name field she needs to leave blank! What to do? HOWARD could help, but he just doesn't understand why XENIA won't ask her friends what their last names are! Harks back to earlier episodes: the time when HOWARD asked XENIA what the bottle of Zoloft left out on the kitchen counter was for, or when he asked her why her skinny friend SANDY wouldn't stop throwing up!
- When ALICE and XENIA team up to try to make a simulation game about AIDS, CLAUDE uses his Wall Street contacts to introduce the girls to venture capitalists! Guest appearances by true-life VCs ROGER

Former comp lit major ALICE decides to write a novel called *The Bridges and Routers of Madison County*, about a handsome Certified NetWare Engineer from Iowa who travels to Minsk.

McNAMEE (a real cutie-pie!) and DAN LYNCH; Dan asks both girls to join him in the hot tub at his Los Altos Hills estate! This is a two-part episode. In the second installment, real-life CEO JEFF BRAUN of Maxis is brought on board to evaluate the girls' project. He compliments them on their work, and promises to check back in a year when they've either worked out the bugs or turned them into features!

- PEGGY gives ROSE a beauty makeover, the better to ensnare HOWARD! So just what does today's girl nerd do to entrance the guy nerd of our dreams? You may be surprised!
- XENIA traps HOWARD into helping her set up a Web server distributing Discordian resources, but the scheme backfires when they inadvertently link its home page to a PeaceNet server!
- ERIK ESTRADA makes a guest appearance as an information superhighway patrolman who tries to recruit HOWARD to join the force. HOWARD is torn, but Electric Frontier Foundation co-founder MITCH KAPOR, in a cameo login, reminds HOWARD of his cypherpunk roots and deep-seated belief that information wants to be free!
- Former comp lit major ALICE decides to write a novel called *The Bridges and Routers of Madison County*, about a handsome Certified NetWare Engineer from Iowa named Mark who travels to Minsk as part of a technology-transfer program. There, he meets Franka, a former tractor plant manager being trained in Western computer technology; when their eyes meet over a jabbering node, they know it's true love. Mark returns to his system integrator's business in Madison County, and Franka tries to keep the flame alive by sending e-mail about her problems bridging Token-Rings over Russian dial-up lines and trying to tunnel IPX packets through IP routers. ALICE can't make up her mind if the lovers should be reunited or remain forever torn apart by duty!
- Season Finale. ANA is asked to stage a fashion show benefiting earthquake retrofitting required for the San Francisco Presidio's military-to-civilian conversion. (Think Andy Hardy movies....) JEREMY contributes tapes of traditional Hmong music he smuggled out of Laos in 1969, which XENIA samples and overdubs with traditional women's bawdy harvest songs from medieval Latvia. ALICE trips through the Net to find archival photographs of as many earthquake-stricken buildings as she can (good visual use of World Wide Web and Mosaic possible here), to be blown up and appropriated, collage-style, as backdrops. To enhance the overall sonic environment, CLAUDE calls on some of his former OSS buddies to contribute oral histories of secret wars they have known. HOWARD wires up the models with electronic sensors that create virtual-reality projections on the walls as they strut down the runway. BOBBY calls on his friends in Hollywood to come up with actress-models (great walk-ons possible here!) for the show. ROSE designs C++ party-favor giveaway software that throws customized runes for each attendee. PEGGY acts as the stage manager and dresser, and VICTORIA will wear the smashing bridal gown that concludes the program. The episode ends with a sudden power failure! ■ ■ ■

Paulina Borsook (loris@well.sf.ca.us) *and Andy Reinhardt* (areinhardt@bix.com) *are writing partners in San Francisco. They have not yet completed their first screenplay.*



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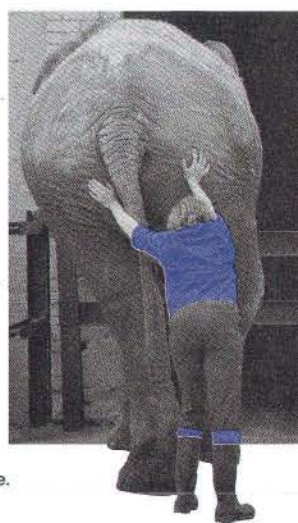
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Don't Repackage – Redefine!

We have to resist media imperialism – the tendency to colonize, to define new technologies in terms of the old.



By Barry Diller

Barry Diller impressed media savants recently with this keynote address, delivered at the American Magazine Conference in Laguna Niguel, California. Before joining QVC Inc. in 1993, Diller was the chair and CEO of Fox Inc., where he oversaw the expansion of the television network. He has also served as an executive at both ABC and Paramount. His message is simple: new media can empower and liberate business leaders if they let themselves imagine untried business models and paradigms.



When television first started, programmers just played with old formats – it took someone like Ed Murrow to shift the paradigm and use television as an eye. To understand new media, says Diller, you have to think in new ways.

I want to start today by asking everyone to pause for a moment. Just clear your mind ... let it still ... for just a little while, because outside, all around us, back in our offices, the currents of communication are churning relentlessly ... furiously. The pace of life won't slow down. It just keeps speeding up.

The fact is, we are awash in a sea of information: junk mail, promotions, fun facts, instant news. We have access to mind-numbing amounts of data – the trash and the treasure, the ridiculous and the not-so-sublime. The QVC library alone taps more than 650 online databases. I get a package of about 80 articles sent to me every day. And that's already been whittled down three times before I see it.

We were promised that all these new options would enrich us. And yet even with this gluttony of choices, our diet is getting thinner.

Meanwhile, we're becoming cluttered with all kinds of info-accessories: CD-ROMs, computers, online services, the Internet. And not only is it decreed that we have to try to comprehend the tonnage of stuff we're supposed to read, but it is ordered that we have to understand and use all these new technologies or we will be fossilized. All this information and all these new products were supposed to make life easier, but now we work harder, longer – just to stay in place and keep up.

I point all this out not because I'm a cynic about the power of technology – far from it. But I believe the acceleration of daily life, this confusing mad rush to get ahead of the future, the *speed* of life in and about the media, is eroding our ability to gather the building blocks to do the real and necessary work of creating new products.

There used to be a cadence, a rhythm to things. It would take time not only for an event to get known, but for it to play out – for the consequences and the analysis and the understanding to incubate.

Today it takes no time at all. Everything is available instantly. Everybody covers everything at once: 32 satellite trucks outside the O.J. trial, interviews with the cousin of the maid who did the dishes at Nicole's, instant judgments. I'm sure, before I'm even finished giving this speech, there will probably be a story on the wires: "Diller pines for good old days."

The most relevant example of the rush to judgment involves those dreaded words "the information superhighway": the 500-channel universe! Surfing the Internet. The dawn of a new era. Two trillion words juiced up to define, describe, trump up all the developments, the possibilities. And then the inevitable thud. Since it wasn't going to take place in an hour and a half, the new conventional wisdom is that it's overhyped, it's not really that exciting, it's off-track, delayed, not meeting expectations.

Our impatience creates an impulse to spin a subject to unsustainable heights and then let it fall. We want everything before the fact; when it doesn't materialize just like that, we decide the whole thing is an impossible dream.

I am convinced, by the way, that Fox Network never would have survived if it were launched today. Sure, back in the early '80s, everyone thought it would fail. But, beyond registering reasonable skepticism for this new venture, we were mostly ignored. When a year or so later, the CFO of News Corp., which owned Fox, made an offhand remark at a public meeting suggesting that the then-current losses of US$90 million would be tough to sustain, a few rumors started circulating that maybe the plug was about to be pulled. But then, six years ago things were slower, the bad news never gained momentum, and we went on with our work. By the skin of our teeth, we got it going before we got diced.

Today, a comment like that would be crushing. It would spin us into the ground. What's the old saying? "A rumor goes around the world in the time it takes Truth to put its boots on." Today, Truth wouldn't bother getting out of bed. A recent example: three guys announce a new studio. Everyone goes wild. Big story. Harking back to the great pioneers. Mayer. Zanuck. Analyses of how they'll build a bigger studio and knock off Disney. Front page *New York Times* blow-by-blows of how they put it together. Five days

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later – five days – the lead story on the *LA Times* says they really have no concrete plans, quotes a bunch of Hollywood birdbrains questioning their chances, and ends by tauntingly asking, "Where's the beef?"

When judgments are formed based on the skimpy information of the day, when reactions are solicited literally at light speed, it's hard to use your brains to make up genuinely new products and then go about the ungainly and messy process of bringing them off. When we become information savvy in a very superficial way, we get dragged along on the dumb current – scanning for patterns and trying to copy those that work. It gives a false sense of security, a dreamy delusion that success will be found by repeating the pattern again and again.

Then – and this is true in the movies, in television, and probably in magazines – we become slaves to demographics, to market research, to focus groups. We produce what the numbers tell us to produce. We chase formulas for ratings or circulation. And gradually, in this dizzying chase, our senses lose feeling and our instincts dim, corroded with "safe" action.

Our preoccupation with the morning line, this unthinking pursuit of the magic formula, clouds our ability to think clearly about all of this.

We *are* on the brink of a great convergence – where the computer, the television, and the telephone will meet to create truly new communications products. Who knows how they'll get along? Who knows what the result will be? What we do know is that the time for hype has passed. And the time has arrived for us to do the tough conceptual work of coming up with a new discipline, a new vocabulary, a new paradigm for what is emerging.

Right now, no matter what kind of publication you put out, you're all asking the same questions: Are we still relevant? How do we make sure, when we're riding down that info highway, that we don't get a flat or become roadkill or some other ridiculous cliché?

The irony is, you're victims of your own hype. As a result, just as newspapers are trying to outdo each other with more graphics and fewer words, thinking that's the way to grab younger readers, so many of you are now slapping versions of your magazine on disc or online.

Here's what I think – you'll go online, nothing really interesting will happen for one or two years, and you'll write off interactivity as a failure. But the first question should have been: Who really wants a magazine online? A magazine in its present form is OK. It's tangible and tactile. It's portable and personal. It has visual impact. You can pick it up and put it down whenever you want. It's already wonderfully interactive.

So if all that is true, what's driving this stampede to electronic publishing? There's not a rationale so much as a reflex. There is a great overarching fear that video will displace text. That leads to a fear that magazines are about to become extinct. And so the herd instinct kicks in, nudging everyone slowly toward the faraway pastures of cyberspace.

First of all, this fear of displacement is misguided. When cable TV arrived, people said, "This is the end of the networks." No. That's insane. There is no such thing as real displacement. Movies survived television, and radio is hardly extinct. To worry about displacement is futile, and to base plans on it is wasteful.

Successful convergence means having the patience to relax and follow your curiosity instead of hyperventilating and chasing the crowd. We need to be convergence contrarians – willing to challenge conventional wisdom, yet able to explore other possibilities.

Of course, that doesn't mean you shouldn't explore new technologies. It *does* mean you have to do so in a way that's got more stuff in it, more content, that's not just repackaging. Taking a movie like *Jurassic Park* and turning it into a videogame – that's repackaging. Taking a bestseller and putting it on tape – that's repackaging. Taking magazine articles and slapping them online, word for word – that's repackaging. And, if you think this is the work of the "New World," you're kidding yourselves. It's more like strip mining. After you've extracted the riches from the surface, there's nothing left – and you're probably too tired to do any real development.

We will fall short if we impose our own familiar business models on the coming convergence. Telephones were not just telegraphs with voice. Computers weren't just calculators with keyboards. And in the future, no one will call your product "magazines with sound and moving pictures." We have to resist media imperialism – the tendency to colonize, to define new technologies in terms of the old.

To define television as radio with pictures may have been accurate, but it missed the point entirely. When television first got started, programmers just played with the old radio shows. They put George Burns and Gracie Allen and Jack Benny in front of the camera. They got a lot of laughs. But it took someone like Ed Murrow to shift the paradigm, to use the television as an eye, to take you, the viewer, into other people's homes. It was first use of the technology of television fused to imagination; TV as a medium to create intimacy. Redefine, don't repackage. Redefining the mission of your ventures is slow, brain-bending work.

Right now, that message is lost on too many people. There isn't a single gold-paved road to success in this new environment. There is no road map or users manual. It's not something you can research. And there is nothing to be gained by forcing new opportunities into the boxes of past experience. What we need to do is slow down. To relax. I know that's counterintuitive, but let me elaborate a bit.

I came upon QVC one summer day two years ago. I had left Fox and was traveling around the country to think about what I would do next. I went to QVC's headquarters and I watched in awe. A live television show, on the air 24 hours, processing more than 130,000 phone calls a day, tracking hundreds of millions of dollars in inventory.

I stood there watching, and thought, "It's TV, it's not TV. It's computers, it's not computers. It's retailing, it's not retailing. It's advertising, it's not advertising." It's an odd art.

And I realized then that QVC, however rough at the edges, was something entirely new and full of potential. It made me think for the first time that there was nuance and artfulness in convergence. When you got its power right, when the various planets were aligned, you saw the possibilities in a different light, as if a new lens had been crafted on top of the one you saw before. A new medium can empower and liberate you, if you let it. But if you try to colonize it – if you try to cram your magazine through a phone jack and call yourself interactive – you'll get nowhere.

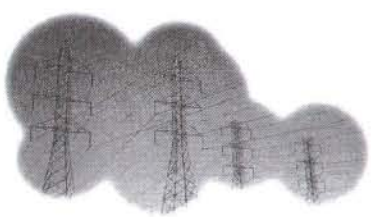
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The question I'd like to ask everyone here is: How much time do you spend online? Have you gone into a chat box for six mind-destroying (and -expanding) hours? Have you played around in different parts of the Internet? If not, before you push your publication online, go online yourself, play with it, let it and its possibilities seep into you.

You cannot begin to understand the nexus of all these new technologies until you jump in and experiment. Open your mind to new ways of perceiving and processing. Learn the unique properties of this new universe. That takes patience, the patience to pursue the possibilities of unintended consequences. Knowing that should not be inhibiting, but liberating.

Now, I'm not arrogant or foolish enough to believe I have the answer to reaping benefits of convergence. I don't. And, if you think I'm here to tell you what the ideas are, I won't. Not because I want to hoard them, but because I can't. I don't have them. The point of all this is that you can't know this – there are no mavens to be found and no research worth its salt. There are no guideposts, no divining rods to tell you what to do.

It's only with patience that you can develop a fluency in a new medium. Let me tell you what I mean. I have invested research and development dollars at QVC in a technology called Smart Agenting.

Smart Agenting uses a computer to construct a profile of you – your tastes, habits, your likes and dislikes. You build that profile by answering questions, endless questions with precise grades of sensitivities. Then, with that profile stored away in its microprocessor, that box does what none of us has the time or the energy to do: it searches every corner of the information universe. It searches wide and targets narrow. It comes back to you in a split second. And it offers the goods and services, and information you want.

I don't bring this up to make a pitch for smart agenting. Time, hard work, and the unknown will someday tell us if it's worthwhile or if smart agents are just a stupid oxymoron. I bring it up to demonstrate the idea that it's possible, no matter what your background, to become fluent in a new medium. You simply have to treat the medium on its terms, not yours. I stumbled upon smart agenting the same way I came upon QVC – as an unintended consequence of playing with the different technologies.

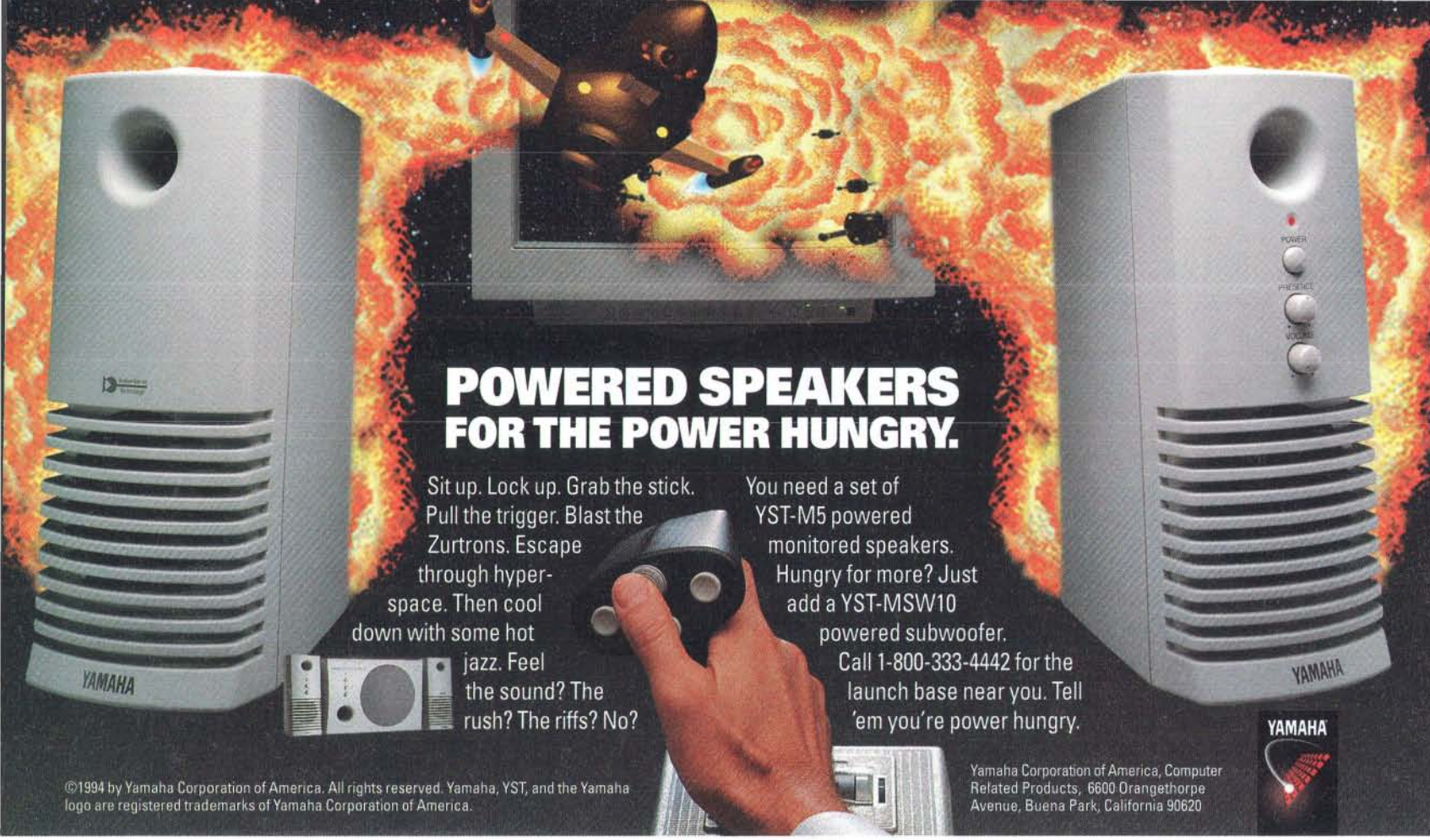
By the same token, successful convergence means having the willingness to subordinate your media expertise instead of imposing it. It means treating a new medium on its terms – not yours. It means having the patience to relax and follow your curiosity instead of hyperventilating and chasing the crowd. We need to be convergence contrarians – willing to challenge conventional wisdom, yet able to explore other possibilities.

Now I don't care what software, hardware, firmware, floppyware, infoware, or underware that technology convergence creates for our creative communities. I just care that real editorship is involved in the process, contrarian and contentious all the way, because I trust absolutely that interesting things will follow.

This fear of displacement is misguided. When cable TV arrived, people said, "This is the end of the networks." No. That's insane. There is no such thing as real displacement. Movies survived television, and radio is hardly extinct. To worry about displacement is futile.

I always thought I was unlucky not to have been alive around 1915, when the motion-picture industry began to break free of the constraints of the Edison-controlled Motion Picture Trust. When Adolph Zukor began to create the infrastructure for what would become the movie industry. Or a decade or two later, when General Sarnoff and Bill Paley figured out how to create the first mass engines of communications with radio and television. Those were uncertain, dramatic, revolutionary times, when people with open minds and ambition remade the world.

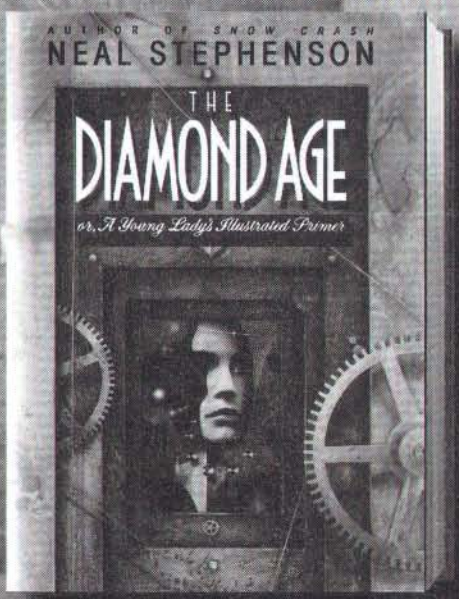
Today and for the next 20 years, those who are awake, and able and willing, will be playing that same defining role in what is surely going to be a radical transformation of all we hear, see, and know. And what a piece of great, good luck it will be to have been present at the creation. ■ ■ ■



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With Psychic Friends Like These, Who Needs Enemies?

Think that buying knowledge from Lexis-Nexis is costly? Resent the bite taken out of your bank account by CompuServe's Executive News Service? Get over it! On a per-minute basis, no information available by telephone is more expensive than the predictions of phone psychics. Rogier van Bakel goes looking for answers in a deck of tarot cards.

Just $3.99 a minute, must be 18.

Frankly, it was the *just* that convinced me. As a journalist, I spend my time raking up US$500 phone bills by calling politicians and tycoons who won't say anything on the record, except that their PR staff just put together a really nice press release that they'd be happy to fax me. So, naturally, I wondered, Wouldn't I get better value for money from a friend? A *psychic* friend, that is? Someone who would gladly take my calls, day or night? Someone with "real answers" to my "innermost questions," as the Psychic Network people kept earnestly intoning?



$3.99 a minute sounded like a steal. Besides, I'd be on the phone five, maybe ten minutes. The dramatized calls in infomercials usually take less than two.

I know what you're thinking. I know you're thinking *scam*. You're thinking *con job*. But hey, smarty-pants: what do you know that Nancy Reagan didn't? After all, we're talking "truly certified professionals" here; clairvoyants who assist "politicians, police forces, and people worldwide." Most convincingly, these seers state up front that they *know* that people are "tired of wasting time and money on phony psychic predictions."

So $3.99 a minute sounded like a steal. Besides, I told myself, I would probably be on the phone five, maybe ten minutes. The dramatized calls in the infomercials usually take less than two.

The truly certified psychic who answered the phone was a woman named Amanda. I knew immediately that she was indeed a professional, because she could tell my fortune despite the really loud TV that was blaring in the background at her end. She, like me, must have felt the serenity of the situation, because she seemed supremely relaxed. In fact, she couldn't stop yawning.

I decided I didn't want to muddy Amanda's predictions by bothering her with the small fact that I had gotten married only a few weeks earlier; I would merely ask her if I would ever find true love. If it turned out I already *had*, with my wife, then Amanda, no doubt, would be the first to tell me.

Amanda: Let me get some information from you *(suppressing a yawn)*. Let me have your birthday.
Me: Sixteenth of August.
Amanda: August is the eighth month?
Me: That's right.
Amanda *(slowly, as if writing it down)*: The ... eighth ... month. The ... six ... teenth.... OK. Your first name, please?
Me: Frank.
Amanda: Spell it.
Me *(surprised)*: Spell Frank? F-R-A-N-K.
Amanda: *(after repeating it very slowly)*: OK, the state that you live in?
Me: Washington, DC.
Amanda: Is W-A the abbreviation for Washington?
Me: No, it's DC.
Amanda: DC? OK. OK. Your city please; spell it for me?
Me: It's Washington, DC.
Amanda: The abbreviation for Washington?
Me: It's just DC, like I told you.
Amanda: No, not DC. Washington. *(Silence.)* What's the abbreviation for it? That's your city, right? Your state is DC. So what's the abbreviation for Washington?
Me: Sorry, I've never heard of that.
Amanda: All right, give me the correct spelling of the way you spell it, 'cause I spell it differently.
Me: You spell Washington differently? Hmm. It's W-A-S-H-I-N-G-T-O-N. You may have heard of it. It's the capital.
Amanda *(after seven seconds)*: OK, now when I spell it, I don't have the N and I in there. That's why I was asking what's your abbreviation for it. I spell it differently.
Me *(stupefied)*: Oh. I see.

Amanda's note-taking was a wonderful sign of thoroughness. Or perhaps she was training for the National Spelling Bee. Slowly, we worked our way down a list that

PAMELA HOBBS

was exhaustive, if not quite complete – mainly because Amanda never asked for my great-grandmother's maiden name. Other than that, any bureaucrat or direct marketer would have salivated unapologetically over the information she asked me to volunteer. My street address, year of birth, last name, age, eye color, height, hair color, weight, shoe size: all these things had to be written down carefully. Then it was time to discuss my favorite color.

Me: Red.
Amanda: *(after a 10-second pause)*: OK, three reasons why you *(yawn)*, 'xcuse me, like red.
Me: Because it's the color of love, and it's cheerful, and –
Amanda: Hold on. Color ... of ... love.... Cheerful –
Me: and bright.
Amanda: And bright. Your favorite animal?
Me: A dog.
Amanda: Three reasons why you like a dog?
Me: I can think of only one. Dogs are good companions.
Amanda: Are they friendly?
Me: Yes. Fine.
Amanda: Friendly.... And a watchdog? A good guard?
Me: Sure. I guess so.

My truly certified absolutely real psychic now needed a personal question answered. Suppose I had been on a desert island for six months, and a nice-looking girl came up to me and asked me to have sex with her. Would I? Naturally, I was shocked – *shocked.* "No way," I exclaimed, and added that I would insist on taking this amorous female to a restaurant before I would even *contemplate* performing the lechery that had been asked of me.

Amanda *(confused)*: There's no restaurants on this island. This is a desert island.
Me: OK, you've talked me into it.

Perhaps Amanda had, in a previous career, been answering the phone at 1-900-SO-WET-4U, because she seemed decidedly more comfortable than I was discussing the topic of hot schmecking (as former *Studs* host Mark DeCarlo, Fox TV's *poète maudit,* would have delicately put it).

Amanda: Now, do you like sex, love sex, or you're crazy about sex?

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Me: Depends on whom I'm having it with.
Amanda: So you like it?
Me: Oh, all right.
Amanda: Like ... sex ... *(yawn)*. Two reasons why you like sex?
Me *(embarrassed)*: Um, because it's intimate and it feels good. Oh, and because if it's good enough for Bob Packwood, it's good enough for me.

By now, the clock was approaching the 20-minute mark. I had already spent almost 80 bucks, which was fine – I mean, you can't blame people for wanting to get the facts straight. Still, I was getting anxious to know what the future had in store for me. Amanda, her psychic gift kicking in, seemed to sense this. She asked me to choose from three differently colored decks of tarot cards. I picked the red deck – the romantic reading. Amanda then diligently shuffled the deck for about half a minute, close to the receiver. She truly had the patience of an angel.

Me *(timidly)*: Would I be offending your psychic powers if I asked you to do it quickly? Because I am paying $3.99 a minute.
Amanda *(unperturbed)*: I'm gonna lay the cards out for you. Do you want me to lay them out in a triangle or a box?
Me: A triangle.
Amanda *(after 30 seconds)*: OK, right now *(yawn)*, I'll be able to tune into your cards and let you know what's in store for your future. OK?

Turns out she had some terrific news. Not only will I have a long and happy life, I am going on a trip sometime soon! Somewhere *out of the city!* And as for my love life: my psychic – my guaranteed genuine and certified, definitely not the least bit phony spiritual helper – was very encouraging.

Amanda: I am picking up through your cards that you haven't had nobody in your life for a while. But in just a few months, you'll be finding a woman. Her height is about 5-6; she'll be weighing like around 135; she'll have short blond hair and blue eyes. You are going to have a very beautiful relationship for six or seven months, and then you're gonna ask her to marry you, and she's gonna accept.
Me: Oh goody! You couldn't speed things up a little by giving me her phone number, could you?
Amanda: What? Oh. Let me try.
Me *(after 20 seconds)*: Does she live abroad? Is it a really long number?
Amanda: No, it's not that. I don't think I can pick up her number. I'm trying to look for it, if it comes up in the cards. *(Another 17 seconds pass.)* No.
Me: Oh. That's too bad. Well, let me ask you this: If I don't meet the right person in a few months, or if I meet a woman who doesn't fit your description at all, can I call you and get my money back?
Amanda *(this time without a second's pause)*: Oh, no way! There is no possible way that that can happen! It wouldn't be fair to us 'cause we're telling those people the true facts about them and if they happen, anybody can call and say, 'your prediction didn't happen, I want my money back,' and for us to return that, that would be going on all day long, seven days a week.
Me: Yeah, I guess there are a lot of dishonest people out there.
Amanda: Right. That wouldn't be fair!
Me: Well, this has been, um, illuminating. Thanks.
Amanda: Wait, I'm picking up a lot more things for you.
Me: Some other time, maybe. 'Bye!

The truly certified psychic who answered the phone was a woman named Amanda. I knew immediately that she was indeed a professional, because she could tell my fortune despite the really loud TV blaring in the background.

I had been on the phone for exactly 30 minutes. Sure, it set me back $120 – but had I not received an enthralling glimpse of times to come? I'm no psychic, but I feel confident in making *this* prediction: If no one stops them, Amanda and her colleagues are going to have a glorious, golden future. ■ ■ ■

Anagram enthusiasts will discover that Rogier van Bakel (rogiernl@aol.com) *has Brave Ink Galore. His latest palm reading showed that one day, his artfully distorted picture will be on the cover of* Wired.



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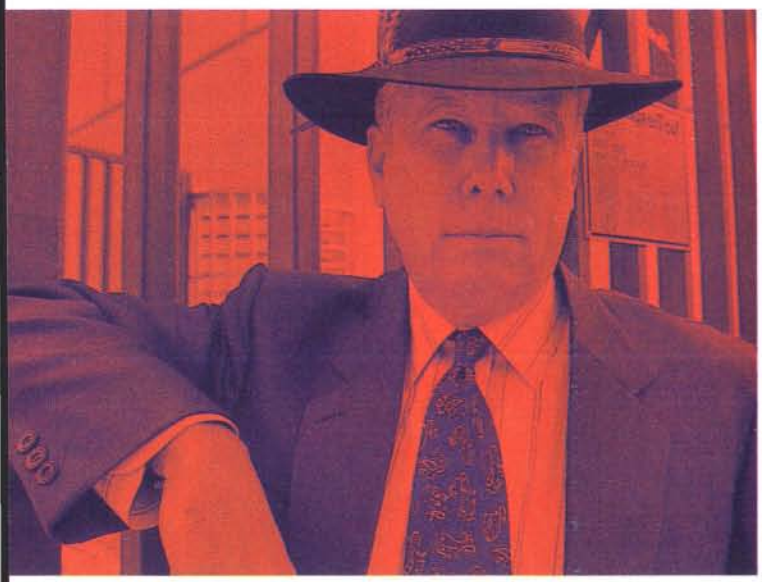
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Surrender or We'll Slime You

Some say John Alexander is on the trail of the greatest advance in warfare since the invention of gunpowder – nonlethal weapons. Others believe he shouldn't be spending taxpayer money without adult supervision.



"The entire concept of national security has changed," Alexander declares. "You need other sorts of force options."

By Mark Nollinger

The Los Alamos National Laboratory, a sprawling complex of beige buildings, stretches across a series of mesas above the stark beauty of the New Mexico highlands. Nearby street names like Oppenheimer and Trinity remind visitors of the facility's reason for being: revolutionary research and development of America's first atomic bombs. Devising weapons of hideous death and massive destruction in the service of national security has long been the name of the high-technology game around here.

If John Alexander's vision of the future is realized, that kind of Cold War thinking might one day become as obsolete as a cavalry charge. A retired Army colonel-turned-technocrat and a member of the lab's Special Technologies group, Alexander is a leader of a growing movement that could change the way the US military thinks about conducting the business of war. How? By providing strategists with a new class of weapons designed *not* to kill.

The efforts at Los Alamos are just part of an innovative new trend in national defense: nonlethality. At facilities ranging from the Lawrence Livermore National Laboratory in California and the Army's Picatinny Arsenal in New Jersey, government-funded scientists and engineers are developing an array of high-tech devices that are supposed to incapacitate, not decapitate, their targets.

"The entire concept of national security has changed," Alexander declares. "Therefore, you need other sorts of force options." If the ideas circulating around the nation's top-secret weapons labs pan out, the nonlethal arsenal of the millennium could include such exotic "force options" as electromagnetic pulse generators and high-powered microwaves, which would short out communication systems and fry electronics. Computer viruses would infiltrate and paralyze banking networks and command-and-control operations. Aircraft-targeting sensors could fall prey to "demons," directed-energy munitions that emit flashes of light brighter than the sun. Clouds of combustion-inhibiting chemicals would choke engines, stopping tanks and troop carriers in their tracks, while metal-eating microbes and super-caustic chemicals would eat away at their armor. Enemy soldiers might be confused by holographic projections, dazzled by laser rifles, or disoriented by low-frequency acoustic beams that provoke vomiting and diarrhea. And if being blinded and humiliated isn't enough to sap their will, they could find themselves trapped in stinging nets or glued in place by ultrasticky foams.

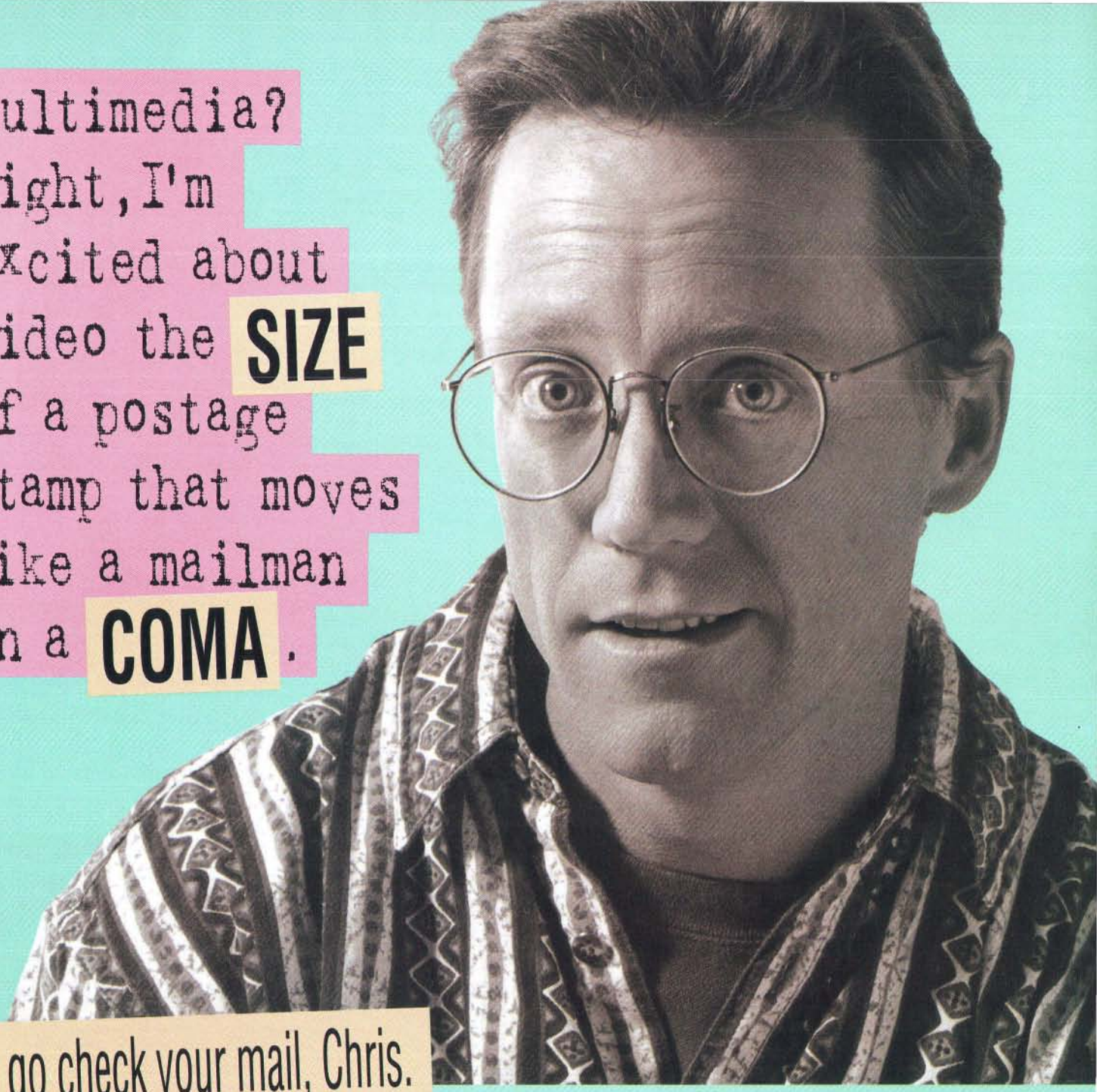
These weapons may seem like they've sprung from the pages of Marvel Comics, but haphazard research into these and other nonlethal technologies has been underway for decades. As far back as 1972, a National Science Foundation report on the subject listed over 30 nonlethal concepts. Details on most of the current projects are hard to come by, as many of the ideas are being developed in highly classified, or "black" fashion. But the Pentagon is pushing to get the technology out of the labs and into the field. The 1995 defense budget includes US$41 million in seed money for some of the more promising devices. Once some of those are selected, insiders say, Secretary of Defense William Perry is expected to authorize a Nonlethal Weapons Steering Committee to introduce the new capabilities into the US arsenal.

While $41 million is pocket change in terms of the Pentagon's $262 billion budget for defense, it marks the first step in the development of a coordinated nonlethal weaponry program. And it's not just international bad guys who could be dazzled, disabled, and immobilized. The Justice Department is also getting into the nonlethal act. Spurred by the 1993 disaster with the Branch Davidians at Waco, Texas, Attorney General Janet Reno and Deputy Secretary of Defense John Deutch last April signed a "memo of understanding" under which the Pentagon will share "dual-use" nonlethal technology with domestic law enforcement agencies.

At first glance, sending an American soldier into battle with a nonlethal weapon makes about as much sense as handing a Buddhist monk a bazooka. But according to a growing number of military officers and national-security experts, the new technologies will allow commanders the opportunity to accomplish the same goals as conventional weapons while minimizing casualties as well as the destruction of hardware and the environment. "Anything you can conceive of using lethal force against you could

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use nonlethals instead, potentially with a faster effect and less political baggage," says Colonel John Warden, Commandant of the Air Command and Staff College at Maxwell Air Force Base in Montgomery, Alabama.

This sort of claim is driving Washington's interest in the new technologies. Traditional US military doctrine – using overwhelming force to "break things and kill people" – has its limits in the New World Order, where a monolithic opponent like the Red Army has been replaced by a scattered mishmash of Middle Eastern dictators, African warlords, and Caribbean élites. With public tolerance of the costs of intervention at an all-time low, decision makers are hoping that nonlethal alternatives might ease the task of playing Globocop. "It's coming from the president's desire to have wars that are bloodless," says Harvey Sapolsky, who is a political scientist at the Massachusetts Institute of Technology. "We don't want Americans killed, we don't want civilians killed, and we don't even want some of the enemies killed. That's a big constraint."

Fans of nonlethal weaponry assert that the technologies will apply across the strategic spectrum, from special operations against terrorists and international drug cartels to full-scale battles with rogue states. Believers like General Edward "Shy" Meyer, a retired Army Chief of Staff, suggest that advanced nonlethal capabilities could even help avoid some wars altogether by allowing the US to impose "techno-sanctions" against its enemies. A dose of combustion-inhibiting chemicals, for example, could have neutralized the threat that arose last fall when Iraq moved a division close to the Kuwait border. "If you had the ability to make all the motor-driven vehicles unable to move without killing any Iraqis," Meyer explains, "that would be a relatively peaceful and nonlethal solution to a very difficult international problem."

At least initially, however, the Pentagon seems to be setting its sights a bit lower. One senior strategist at the Department of Defense says nonlethal weapons have the most potential in "low-intensity conflicts" like those in Somalia and Haiti, where it is difficult to tell enemies from civilians. "When we defeated the Iraqi army in the desert, if we didn't know exactly where an Iraqi artillery piece was, we just covered a whole area with lethal fire," says the Pentagon official, who asked to remain anonymous as the new policy for nonlethals has not been announced publicly. "We can't do that in downtown Mogadishu. If I can neutralize a group of people in a nonlethal way, then go in and sort out who the bad guys are, that's an interesting kind of capability."

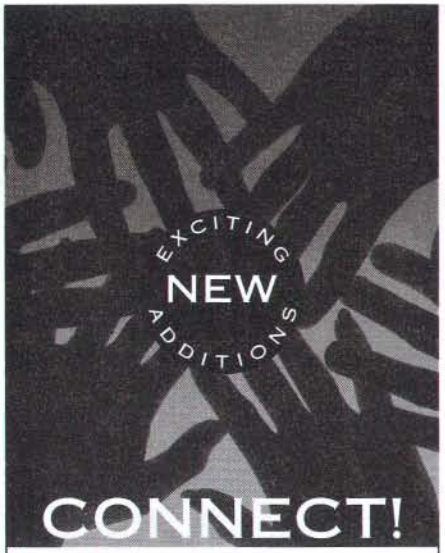
That's also a kind of capability that appeals to domestic law enforcement types, who are desperate to update their crime-fighting abilities while avoiding the lawsuits and bad press that stem from excessive force. "State and local police are still equipped much as Wyatt Earp was in the late 19th century, and they still have the same basic options when confronting a subject," writes David Boyd, science and technology chief at the National Institute For Justice. "They can talk him into cooperating, beat him into submission, or shoot him. Law enforcement clearly needs more alternatives."

"Anything you can conceive of using lethal force against you could use nonlethals instead, potentially with a faster effect and less political baggage," says Colonel John Warden.

Boyd argues that the 1992 Los Angeles riots might have been avoided if police confronting Rodney King had had more than primitive nonlethals (batons and Tasers) at their disposal. Like a gun that shoots "sticky foam," for example. Originally developed by Sandia National Laboratories in Albuquerque to protect nuclear facilities from terrorism, the coffee-colored liquid expands up to 50 times its original volume when mixed with air, turning into a harmless, taffylike goo that immobilizes its target on contact. Also being researched at Sandia: a "smart gun" with an electronic chip that prevents anyone except its owner from firing it, and an aqueous foam that can fill a room with soap-like bubbles, temporarily preventing occupants from seeing and hearing while still allowing them to move and breathe.

Still, problems remain. Before cops can start yelling "Stop, or I'll slime you!" to fleeing suspects, researchers have to figure out how to get sticky foam unstuck. Baby oil works best, but it takes about a minute to clean up each square inch of the stuff.

More importantly, some weapons being



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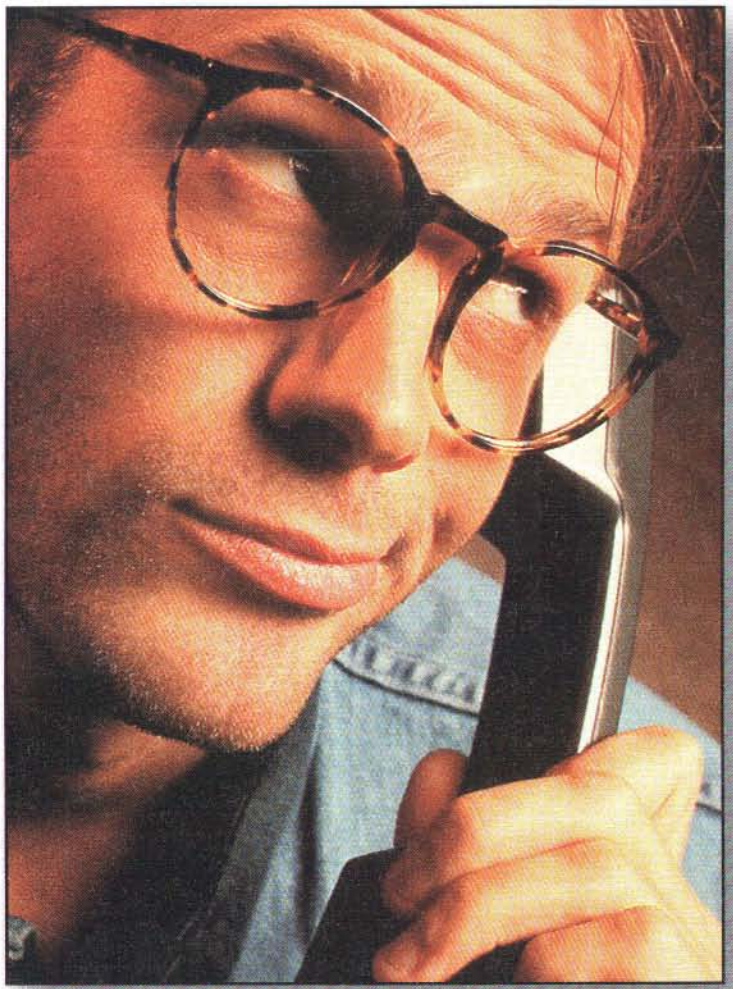
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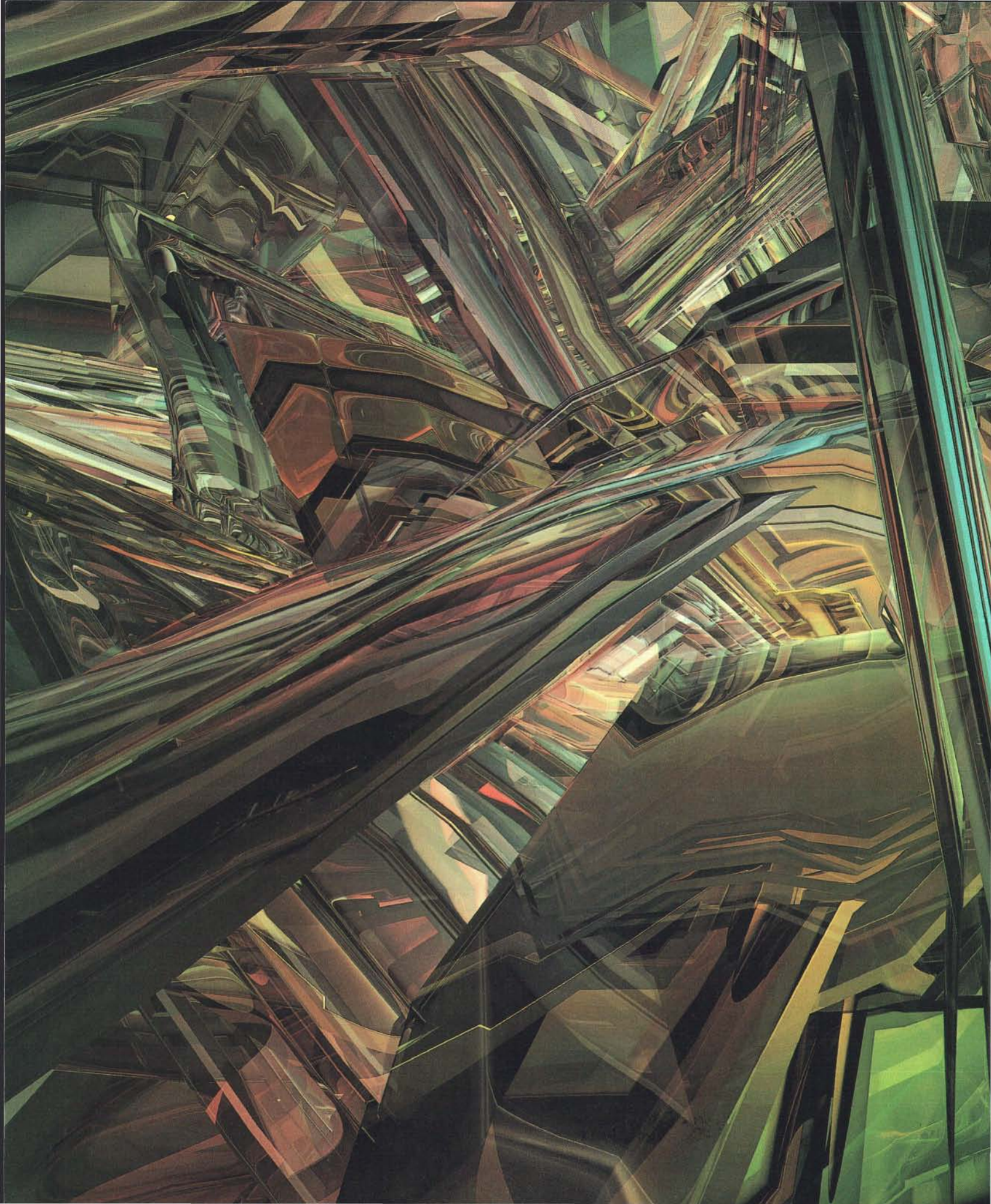
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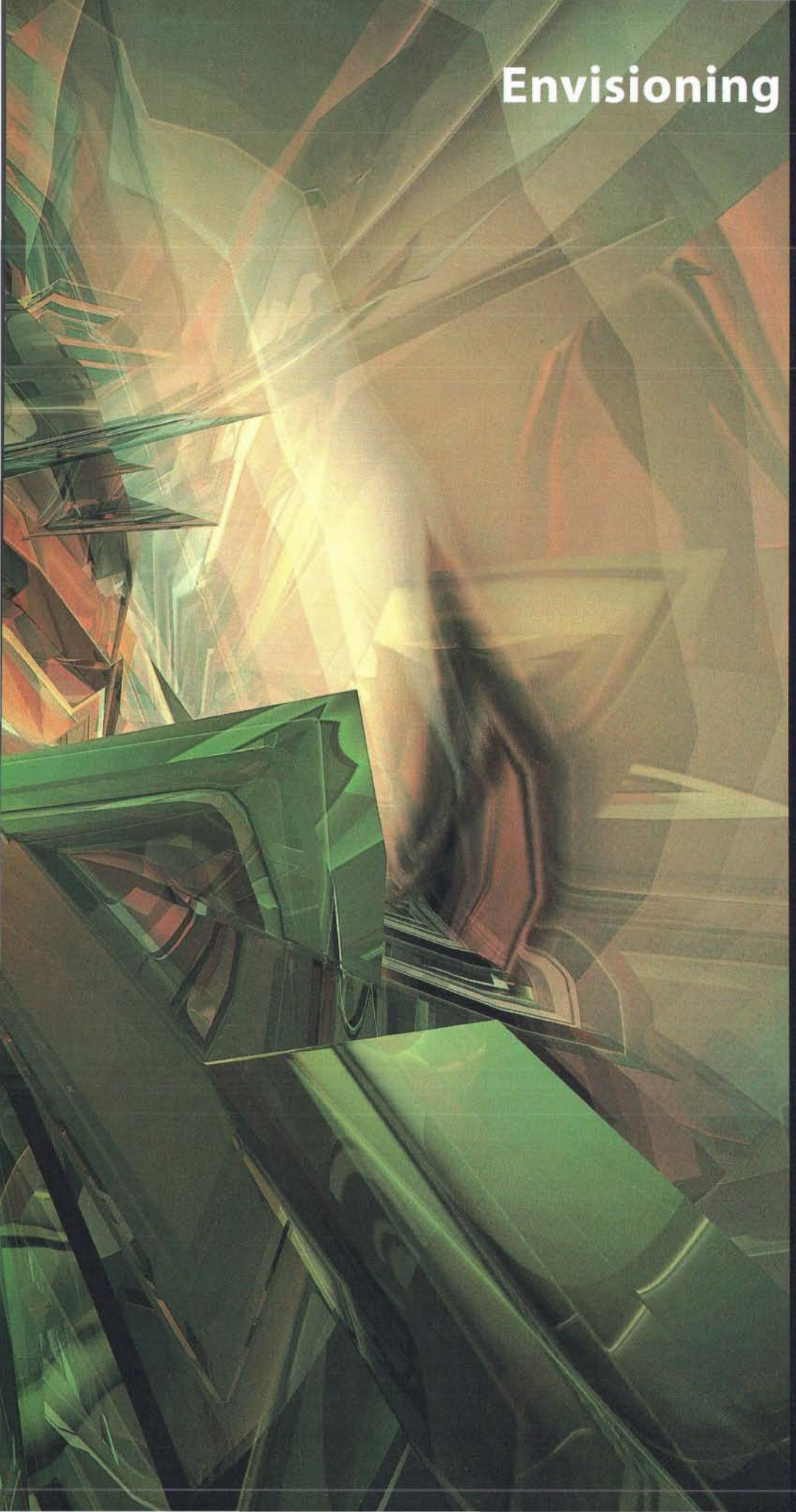
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Envisioning the Impossible

Like a true hacker, Stewart McSherry sleeps until noon and spends most nights awash in the glow of a CRT. But while McSherry works in a back-room studio at Silicon Graphics Inc., he's not designing wicked-fast hardware. He's laboring over virtual glass sculptures, bending light with silicon chips.

McSherry started out studying computer science and art in college. He moved on to design outdoor laser shows, then tried commercial animations – flying TV logos. He is now the first artist-in-residence at SGI, where he pursues his dream of melding art into technology, no strings attached. His job is simply "to build impossible things." He has a room of SGI machines with so much graphical horsepower, "I can't keep them busy most of the time." This despite the fact that his final creations can take days to render.

McSherry uses computers to chase art into more abstract modes than a painter or glassmaker ever could. This piece began as primitive shapes that he stretched and deformed. McSherry then added textures and color and placed light sources inside the shapes. The final picture traces hundreds of thousands of rays of light to create a world that McSherry hopes, someday, to cast in glass.

– Kevin Kelly

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touted as nonlethal can have some pretty brutal side effects. The International Red Cross opposes laser weapons because it fears the devices might permanently blind combatants. Looking for law-enforcement applications of high-powered microwave technology, a researcher at Los Alamos claims to have figured out a way to stop a car engine by disrupting the electronics with a burst of energy. Unfortunately, it could bake the vehicle's occupants. Other observers fear that the various nonlethal gasses, liquids, and microbes under consideration could violate UN-sponsored treaties on chemical weapons and biological warfare.

Steve Aftergood, an analyst at the Federation of American Scientists, cites an incident in the Persian Gulf War – when the Air Force launched a missile carrying a warhead filled with carbon fibers that shorted out Baghdad's electrical plant – as an example of how supposedly nonlethal technology can inflict serious harm. "The loss of that electrical power led to immense suffering, at least comparable to a bomb strike," he says. "Hospitals and a whole range of civilian activities were shut down." Aftergood accuses advocates of deliberately obscuring such worries to sell the nonlethal program. "What concerns me is the marketing of nonlethal weapons as a kind of violence-free means of conflict," he says. "The concept of nonlethal is admirable, but it is unlikely to lead to a fundamental change in the character of warfare. War by definition means killing people, and it will continue to mean killing people."

Some experts are concerned US soldiers could be the ones who end up in body bags. MIT's Sapolsky wonders how useful the weapons will be against adversaries who are armed to the teeth, a question also on the minds of skeptics in the military. "When it comes to dealing with really bad people," he says, "it's going to be hard to stop them with nonlethal technologies and have none of our soldiers get killed in the process. This is going to be impossible to do. So I think there's another answer besides nonlethal, and that's staying home."

Advocates like John Alexander caution that nonlethal technologies are intended to augment, not replace, conventional weapons. "If they shoot real bullets, we'll shoot real bullets," he insists, adding that nobody is suggesting that American troops be placed at undue risk. And while he concedes that "nonlethal" can conjure up unrealistic visions of bloodless war, Alexander argues that critics are missing the point. "There is nothing that

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is totally nonlethal," he says, pointing out that any device, under the right circumstances, could kill somebody. "What you are talking about is objectives. How do you minimize the number of casualties?" The fact that the rubric is proving a bit controversial, he continues, only points up its usefulness. "There is a need to capture imaginations," Alexander says. "There is equally a need to think rationally. We keep saying this is not a panacea."

Alexander, 57, is very good at capturing imaginations with the idea of nonlethality. A white-haired technology manager sporting a shirt pocket full of pens, he can't claim to have invented any of the technology. But for the last six years, Alexander has been giving speeches, writing papers, organizing conferences, and pestering the defense establishment about nonlethal weapons. "If this thing ever turns into a pearl," says General Meyer, "he's been the sand in the oyster."

Asked why he has devoted so much time and energy to promoting nonlethals, Alexander explains that the US will always project force to defend its interests and values. "I think it is in our best interests to do that as humanely as possible. Killing folks just doesn't get you a lot." In recognition of his efforts, the respected journal *Aviation Week & Space Technology* honored Alexander in January 1994 as an "Aerospace Laureate." He is "the intellectual leader in the field," according to Robert Kupperman, a senior advisor at the Center for Strategic and International Studies, a Washington, DC, think tank.

Despite the accolades, another side of Alexander has fueled skepticism of the nonlethal idea. And it's easy to see why – parts of his résumé seem lifted from *The X Files*. A former Special Forces commander who led Cambodian mercenaries behind the lines in Vietnam, he holds a doctorate in education from Walden University in Florida for his work in "thanatology" – the study of death and dying – with psychiatrist Elisabeth Kübler-Ross. In 1980, Alexander published an article in *Military Review* called "The New Mental Battlefield," in which he advocated investigating military applications of telepathy, out-of-body experiences, and other paranormal phenomena. He has been a president of The International Association For Near Death Studies, has written papers and organized conferences on alien abductions and other "anomalous phenomena," and has advised PSI-TECH, a company founded by former intelligence officers that reportedly claims to use "remote viewing" – a kind of telepathy – to gather information for corporations and government agencies.

Alexander's adventures in the twilight zone have proven to be easy fodder for critics like Aftergood. "John Alexander is by all accounts a resourceful and imaginative individual," Aftergood concluded last year in an article for the *Bulletin of Atomic Scientists*. "He would make a splendid character in a science-fiction novel. But he probably shouldn't be spending taxpayer money without adult supervision."

Alexander insists that his interest in things paranormal is an intellectual avocation completely unrelated to his work at Los Alamos. "My position has been that there's really a fruitful area for science to get involved in. It ought to be done rigorously, with the same kind of standards that apply in any other field. But you don't reject the evidence just because it doesn't fit your hypothesis." He complains that critics like Aftergood adhere to a double standard by attacking him for his beliefs but not going after scientists whose religious faiths incorporate a belief in the mystical and the miraculous.

"The concept of nonlethal is admirable, but it is unlikely to lead to a fundamental change in the character of warfare. War by definition means killing people, and it will continue to mean killing people."

Linking Alexander's explorations of the nether world with nonlethal technologies does seem like a cheap shot – after all, the weaponry will stand or fall after being tested by scientists and soldiers. But there is an indirect connection. Alexander, who had begun working on antimateriel technologies in the latter part of his military career, retired from the army in 1988 and joined Los Alamos. Shortly after, he hooked up with writer Janet Morris on a book project. The result of their collaboration was *The Warrior's Edge*, a self-help manual that shows executives how to use the mind-training techniques Alexander studied in the military – "remote viewing" among them – to achieve victory on the business battlefield.

Morris, a research director of a DC think tank called the US Global Strategy Council, and her husband, Chris, a fellow writer and national security expert, were also intrigued by the nonlethal possibilities of some of the futuristic technologies being researched at the government labs. With the fall of the Berlin Wall in 1989, the time seemed especially ripe for new ideas. Janet Morris enlisted the support of her boss at the time, Ray Cline, a former deputy director of the CIA whose connections opened doors in Washington. Cline put together the Nonlethality Policy Review Group, which was made up of various ex-government officials and military chiefs of staff. The group spent a year studying the issue and forming recommendations. Janet Morris then published a widely circulated white paper outlining the nonlethal idea and listing the various available technologies. In *Nonlethality: A Global Strategy*, she trumpeted the concept as a "revolutionary strategic doctrine" that would allow the US to seize the moral high ground in coping with the demands of a new world order marked by threats ranging from ethnic violence to narco-trafficking.

Intrigued, Dick Cheney, secretary of defense under George Bush, appointed his own nonlethal task force after the gulf war. Though the task force enthusiastically endorsed the concept, the efforts of Cline, Alexander, and the Morrises to lobby for a comprehensive policy of nonlethality limped along at the Pentagon during the Bush years. "We spent three years supporting the Cheney defense department's nonlethal task force but couldn't get anywhere," Morris complains, "because there was such a great desire to resuscitate the Cold War."

Then came the Clinton administration, which inherited the foreign policy headache in Somalia. With US forces stymied by stone-throwing mobs and teenage snipers on the streets of Mogadishu, Alexander and members of the Council of Foreign Relations, an independent advisory group, met with then-Defense Undersecretary John Deutch on the pacifying potential of nonlethals. Deutch was impressed enough to appoint a task force that is now assessing the technologies and forging a policy for their use.

While the Pentagon is keeping mum about exactly which technologies are up for initial funding, insiders suggest that dual-use devices, potentially effective on the streets of both Philadelphia and Port-au-Prince, are likely to receive top priority. Sticky foam is



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one candidate, as are acoustic weapons being developed at Picatinny Arsenal. Also attracting attention is "Lifeguard," an antisniper apparatus under development at the Lawrence Livermore National Laboratory. The device, which can be mounted on military vehicles or buildings in high-crime areas, uses a computer-linked sensor that can identify the exact location of gunfire in less than a second. The military application, however, is not necessarily nonlethal; the developers suggest that Lifeguard could be attached to a gun that would fire back instantly and kill any would-be snipers.

Still, it will probably be years – in some cases decades – before any of these technologies show up on city streets or overseas battlefields. Some nonlethal advocates say acoustic beam weapons may be the first. But according to Cline, who is a project manager at the Army's Armament Research, Development and Engineering Center at Picatinny Arsenal, a field prototype is three to five years away, "if we get consistent funding."

That's a big if. One highly placed defense official doubts nonlethals will receive major financial backing in the near future: "We live in a zero-sum environment," says the Pentagon official. "Anyone who proposes spending money on new things has to find money to take from old things first. And that's always a contentious process." Nonlethal funding promises to be even more so, as many of the defenders of "old things" remain skeptical of weapons that neutralize a target rather than destroy it. "If I hit these guys between the eyes and say, Hey, your bomb is obsolete, or your rifle is obsolete," says Colonel Warden of the Air Force, "then they get real mad and make it a heck of a lot more difficult to get any movement in the nonlethal area."

Even if the money is allocated and the weapons perform as advertised – another big if, as few of the devices have progressed beyond the lab model stage – the extreme secrecy of some of the weapons' development could be another stumbling block. Both skeptics and advocates have criticized the government for keeping much of the research under such ultratight wraps. "A large fraction of this work is highly classified and unaccountable to anyone," says Aftergood. "We know from the human radiation experiments that the government will sometimes violate ethical standards in conducting experiments." On a different tack, Janet Morris worries that the projects may be buried in the "black" world by opponents of nonlethality within the defense establishment. And Alexander acknowledges that progress on some of the highly classified technologies may be slowed by the resulting lack of peer review that normally accompanies scientific research.

Other observers fear that certain nonlethal weapons may have dangerous consequences. Experts point out that technologies like computer viruses and information warfare – which Alexander calls "as serious as weapons of mass destruction" – would be more effective against a high-tech society like the US than most of its likely opponents. "If we could destroy a banking system, I bet that would really screw up, say, the Japanese," says Harvey Sapolsky of MIT. "But it would probably screw us up, too."

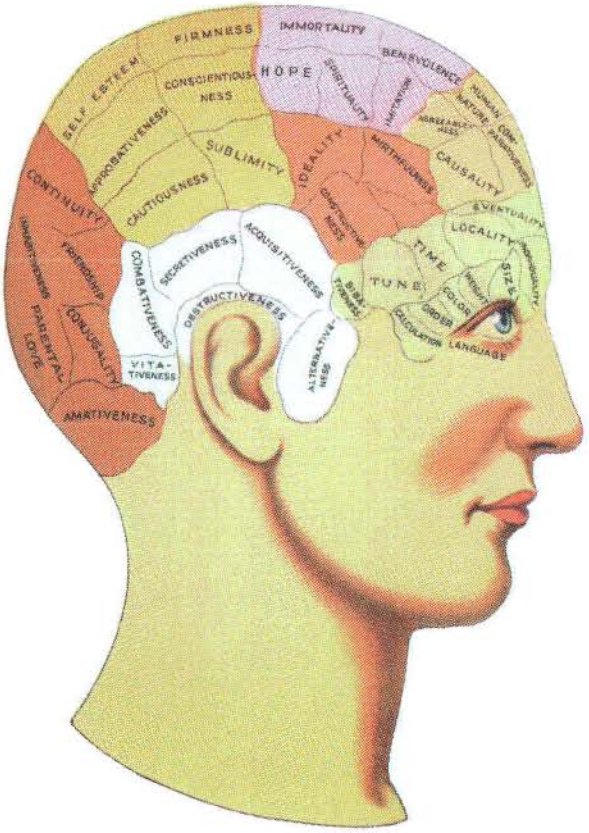
And some nonlethal advocates worry that putting a potentially low-risk military capability into the hands of politicians could be like giving a child a loaded gun. "There's a subset of Congress and consenting intelligent Americans that doesn't want to hand a US administration a ticket to adventure that's totally unconstrained," Morris says. Indeed, last spring, The American Assembly, an august congress of academics and national policy experts that meets twice yearly, recommended that the National Security Council conduct an urgent review of nonlethality. But it also warned that "effective nonlethal technology might increase the chance that we would intervene simply because we could, rather than because we should."

John Alexander acknowledges that such potential pitfalls are reason for concern. But as the nonlethal program moves forward, he says, the various issues will be debated and resolved, one way or another. He just hopes that it will be done quickly, as he believes the technology is going to be developed – if not by the US, then by someone else. "This is a classic area in which the technology is outstripping ethics and philosophy, " Alexander says. "What we need are mechanisms to come to grips with these sorts of problems faster. We no longer have the time to have decades of debate." And while the debate over nonlethal technology rages, Alexander adds, it is important not to forget the bottom line.

"I had a guy who wrote me saying, This is terrible, this is awful, look where you're going with this," Alexander recalls. "I said, Compared to what – being dead? You know? What are the alternatives? You've got to think about it in terms of alternatives." ■ ■ ■

Mark Nollinger (mark noll@aol.com) *is a Southern California-based freelance writer. He wrote "Rage" for* Wired *2.06.*

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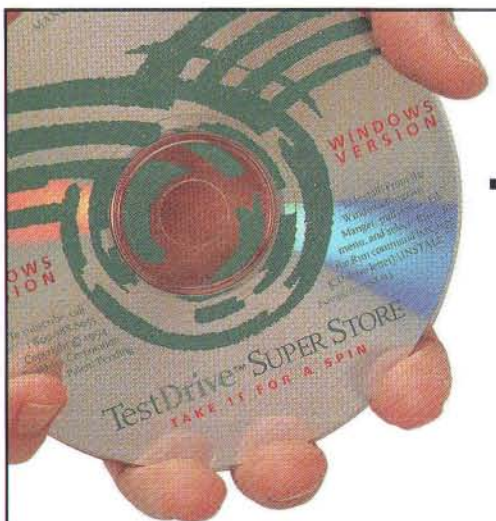


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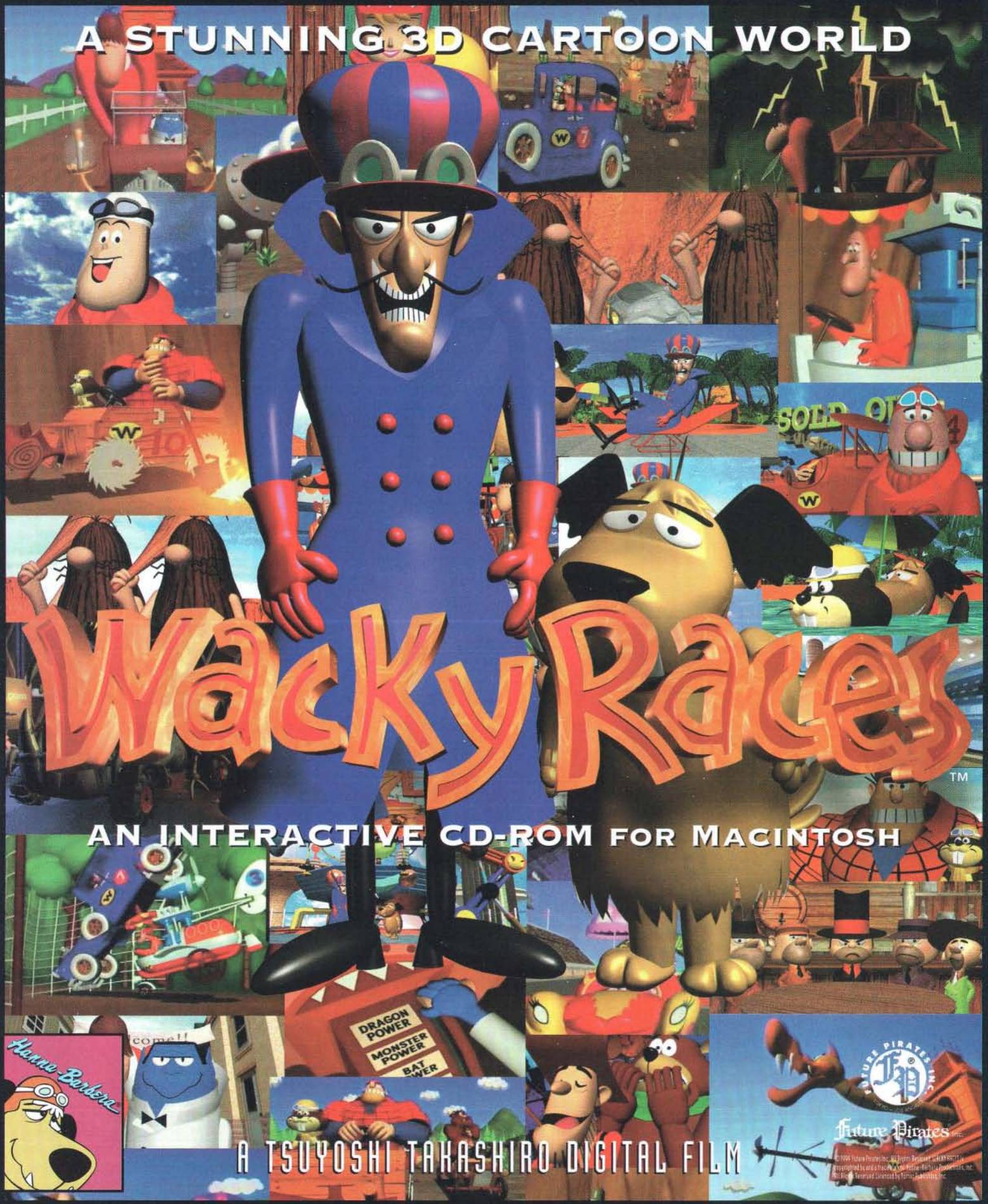
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The Emperor's Clothes Still Fit Just Fine

By Lance Rose

Or, copyright is dead. Long live copyright!

Copyright is dying, some say. It is too old to run on the Net; it can only grasp feebly at streams of electrons spraying through cyberspace. Copyrights are relics of the crude physical world, best suited to brute things like books, tapes, floppy disks, and CDs.

But new challenges threaten to overload the copyright system. How can we balance efficiently the rights of multimedia developers to sample, alter, and incorporate older works against the rights of copyright owners to be paid whenever their works are used? Who should be responsible when copyrighted works are infringed online – those who create the infringing copies, or the online services which act, often unwittingly, as vehicles for mass distribution? Is copyright law and its copy-based model a sensible way to govern computer networks, where making copies is easy as flicking a light switch, or should creators look to new noncopyright schemes for controlling use of their works, such as the usage-metering schemes now surfacing for CD-ROM and online publishing?

These are all important issues, but another debate is underway: can copyrights be enforced on the Net at all? For traditional physical goods, the factories that produce pirate books, T-shirts, and records don't move around much, making them easy targets for investigators. Once found, the large profits reaped by infringers make a tantalizing prize for copyright owners, fueling lawsuits and even leaving a little over for the owners after paying off the lawyers. There is also a natural cap on the universe of infringing activities in the physical world. The hefty start-up investment needed for copying equipment and setting up distribution channels limits big-time bootlegging to a few rich players. Pursuing these mass infringers is the copyright owners' version of one-stop shopping: you can collect legal damages for many small rip-offs by suing just one mass infringer. The small-time infringers are all but ignored.

In contrast, on the Net, you don't need heavy equipment to infringe. Any college kid with a tuition-paid account can readily copy any digital work and send it to thousands of places online for no fee. Add to this the recently developed Net service known as the "anonymous remailer," and no one will be able to identify that kid as the wrongdoer. For instance, I can scan this issue of *Wired* into digitized form, zip it up, and pump it out anonymously to thousands of newsgroups and bulletin boards. No one will ever track me down. If others do the same, why would anyone want to pay for *Wired*, or anything else we can digitize? The field of potential infringers, once limited to a few well-heeled players, has broadened to everyone with access to computer networks and services – as many as 25 to 50 million Net users worldwide at the moment. The new ease of infringement and difficulty of enforcement bring us inexorably to the conclusion that copyright is dead.

This is a seductive view among those captivated by the idea that "information wants to be free." But it is wrong. Businesses built on copyrighted products – record companies, book publishers, film producers, and the like – never depended on stopping all infringements. On city sidewalks and in country flea markets across the nation, you will find truckloads of bootleg music tapes, videos, and software, as well as knockoff T-shirts and watches. Infringements galore! Visit some foreign countries, especially in Asia, and you will find whole economies based on ripping off US software. Surging trade in knockoffs and bootlegs is a fact of life for the music, film, publishing, computer, and other copyright-based industries.

The Net did not introduce low-cost, anonymous infringement to the world. Anyone can buy a photocopier, tape deck, or computer and become a small-time infringer who's almost impossible to detect. Yet many companies in hard-copy industries enjoy year after year of record profits. Look at shareware companies, which are based on the idea of rampant, out-of-control copying of their products. They are making thousands, millions, in market niches where even the most wildly optimistic observers estimate no more than 5 percent of the people who use shareware pay for it.

How do these companies stay in business? It's simple: copyright law succeeds at maintaining public markets for copyrighted products – markets where the owners can charge and receive a price for those products. It is irrelevant whether any given infringement goes unpunished – as long as it is kept outside the public marketplace. This is easy. Cops have plenty of experience in sweeping the public markets clean enough for business. Now they are walking the beat regularly in the online public markets: online services, bulletin boards, and the Internet.

For instance, the Software Publishers Association reportedly has about 2,000 computer bulletin boards under continuing surveillance, while the FBI readily lurks anywhere it suspects wrongdoing. These groups, as well as large copyright-owning corporations, bust notorious online services every now and then, and wave their fists at lots of others (major fist wavers include LucasArts, Lotus, Novell, Playboy, Paramount,

and Walt Disney). Playboy recently won a court order against the Georgia bulletin board Tech's Warehouse for trafficking in digital images of its magazine pinups; Sega, of video-cartridge fame, obtained a well-publicized shutdown of the Maphia pirate BBS in California. Not content with such small fry, the Harry Fox Agency in New York (a major music-rights licensing group) is suing CompuServe for millions of dollars because CompuServe's users were supposedly using the online service to trade large quantities of infringing songs. These legal tactics and others will keep online systems scared straight. They will discourage organized copyright infringement on their systems, especially infringements out in the open.

The anti-infringement drumbeat is pounding ever more loudly. Criminal indictments were recently charged against system operator David LaMacchia of MIT and the Davey Jones Locker bulletin board. Other criminal actions are pending: against Rusty and Edie's bulletin board in Ohio, and a group of five bulletin boards recently raided in Texas. Such legal scare tactics assure that online systems who are more interested in business than playing cops and robbers will discourage organized copyright infringement on their systems, especially infringements out in the open.

OK, so the public thoroughfares can be kept honest, but won't criminals and pirates continue to operate elsewhere? Sure, but only if they stay deep underground, where they won't interfere with public markets where the copyright owners make their profits. If a pirate operation drifts close enough to the surface that it threatens legitimate markets, the Net cops will infiltrate and bust it before it can make a dent in the copyright owner's profits, regardless of whether the pirates are using encryption to cloak their identities. Net users who aren't at least mildly familiar with the underworld will never even hear about such systems before they are dismembered, and will confine their purchasing to the legitimate above-ground markets for copyrighted goods.

The Software Publishers Association and Business Software Alliance maintain the distance between public and pirate markets. Despite their constant public relations bombast about billions of dollars in sales lost to software piracy, these vigilante groups know they have zero chance of capturing those would-be revenues. Their real job is patrolling the border territory between mainstream software markets and pirate lands, gunning down anyone foolish enough to breach the neutral zone. Don't ever expect the Software Publishers Association and Business Software Alliance to admit to their lowly border guard status, however. Their fangs are bared at all times, hissing, "don't copy that floppy." As markets for all sorts of digital industries other than software move online, we are seeing the organizations for those industries move in to perform functions similar to the SPA, including BMI for musical performance rights and the Writers Union for copyrights in both newspaper and magazine articles.

Fine, so the black markets can be kept deep underground. But who needs black markets? Can't we all use anonymous remailers to keep the Net knee-deep in infringing copies? Nope. Net cops can swiftly clean each new infringement out of the major online markets as soon as it appears. They will soon become better at it when copyright owners begin deploying software agents that can roam the entire Net, searching out anonymous infringements. Every time a pirated work is spread to the four corners of the Internet by an anonymous user, software agents will quickly sniff it out. Anonymous infringements will arc across the Net like shooting stars, and disappear from sight just as quickly. Those who want the latest freebie will have to scramble for it before the cops and their software agents go out to sweep up the mess.

One of the limits on enforcing copyright on the Net is the ease of setting up private, informal exchanges of works between friends. Not black markets exactly, but "friend-to-friend markets." If one of my friends has a video, song, book, or piece of software that I want, I can easily get it privately through the Net, and the cops won't be any the wiser. There will be no stopping these personal exchanges online, just as home taping could not be stopped. Indeed, just last year, Congress threw in the towel on physical taping and added a provision to the Copyright Act making it legal for us to make noncommercial music tapes for our friends.

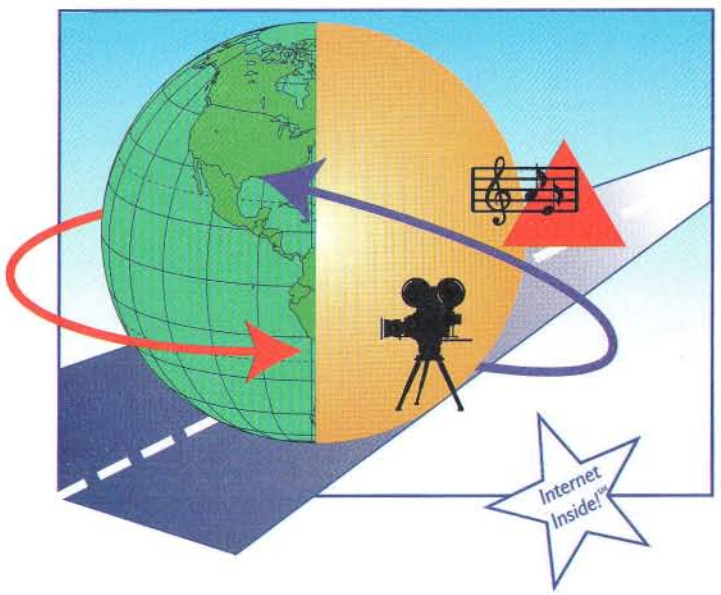
Any college kid with a tuition-paid account can readily copy any digital work and send it to thousands of places online for no fee.

Can the Net be leveraged to extend friend-to-friend exchanges to include far larger groups of people? Can we all get the works we want cheaply or for free among private, interlocking circles of friends? This is a tempting thought, but friend-to-friend markets are far more likely to remain small and self-limiting. We might refer to an extended circle of trading acquaintances as "friends," but in fact few or none of the participants will know everyone else in the circle. This makes such groups ripe for infiltration by the cops, who will do so readily if enough freebies pass within these expanded groups that they noticeably reduce sales in the legitimate markets. A symbolic legal attack every now and then will keep these groups in check, using the recently increased criminal provisions of the Copyright Act to send digital traders to jail for the felony of possessing 10 or more illicitly made copies of copyrighted works worth a total of US$2,500 or more.

Yet another prediction for the Net is that online media are moving toward "narrowcasting" – targeting smaller and smaller audiences with highly defined preferences. Examples today would include high-priced industry newsletters for company executives, with cir-

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culations measured in the hundreds or low thousands, and prices of several hundred dollars per year for a subscription; and industry and demographic studies that may sell a few dozen copies or less, but at a price of thousands of dollars for each copy. The audiences for these media products may be small enough, and their members familiar enough with each other, that they may be able to defeat enforcement of narrowcasted content copyrights by trading through friend-to-friend networks that never become extended enough for easy infiltration by the cops. This prospect is real, but largely irrelevant for such media products. Copyright law is aimed primarily at protecting mass-market works, not high-priced, small-circulation specialty products. The small size of the audience that makes copyright enforcement difficult also springs loose other legal protections, such as distributing the narrowcasted materials under confidentiality restrictions and strong copy protection. These mechanisms don't work in mass-market environments like Blockbuster and Kmart, but they are routinely used and accepted among those who use small-market, specialized products.

Another way to understand the relationship between legal copyright markets and illegal markets such as black markets and friend-to-friend markets is to consider the question: What is the consumer's true cost of obtaining digital works? Say I'm looking for the latest Madonna single in digitized form; it costs a few dollars at an authorized store, but in an illicit market I could get it for a buck, or even for free. In this scenario, doesn't online piracy knock the legs out under copyright-based marketing after all?

Not at all, when we consider what you or I may have to go through to get a copy. To get the illicit version, you need to find someone who has it, which means keeping up with the whereabouts of those who collect the kinds of music you like. It's not easy to stay informed about these people. Anyone making an array of digital works available for infringement by large groups of people will be easily found and quickly busted by the Net cops. The survivors will be those deep enough underground that the cops can't readily find them, moving as necessary from dark corner to dark corner. Keeping track of these shady characters will require becoming part of an underground information network yourself, and maintaining strong enough security to keep out the copyright narcs.

Now we can compare the true costs of the above-ground Madonna single to the pirated version. The official Madonna single still costs a few bucks. The pirated version's cost is: (1) a buck or for free, plus (2) all the time and effort needed to track down pirate dealers with the stuff you want (and who are so deep underground even the cops can't find them), plus (3) more time and effort on security procedures for dealing with pirates and avoiding detection, plus (4) the legal risks of being involved in clandestine criminal activities. Given this choice, consumers who just want the Madonna single will flock to the stores with large and organized inventories, pay a few bucks, and conduct their business relaxed and in the light of day. The adventure and risk of hunting down pirate suppliers and avoiding the cops will be left to cyberpunk romantics and belligerent information-freedom fighters for whom the game of getting the goods illicitly is the object anyway. Make no mistake, though. Those playing cops and robbers are paying for their entertainment.

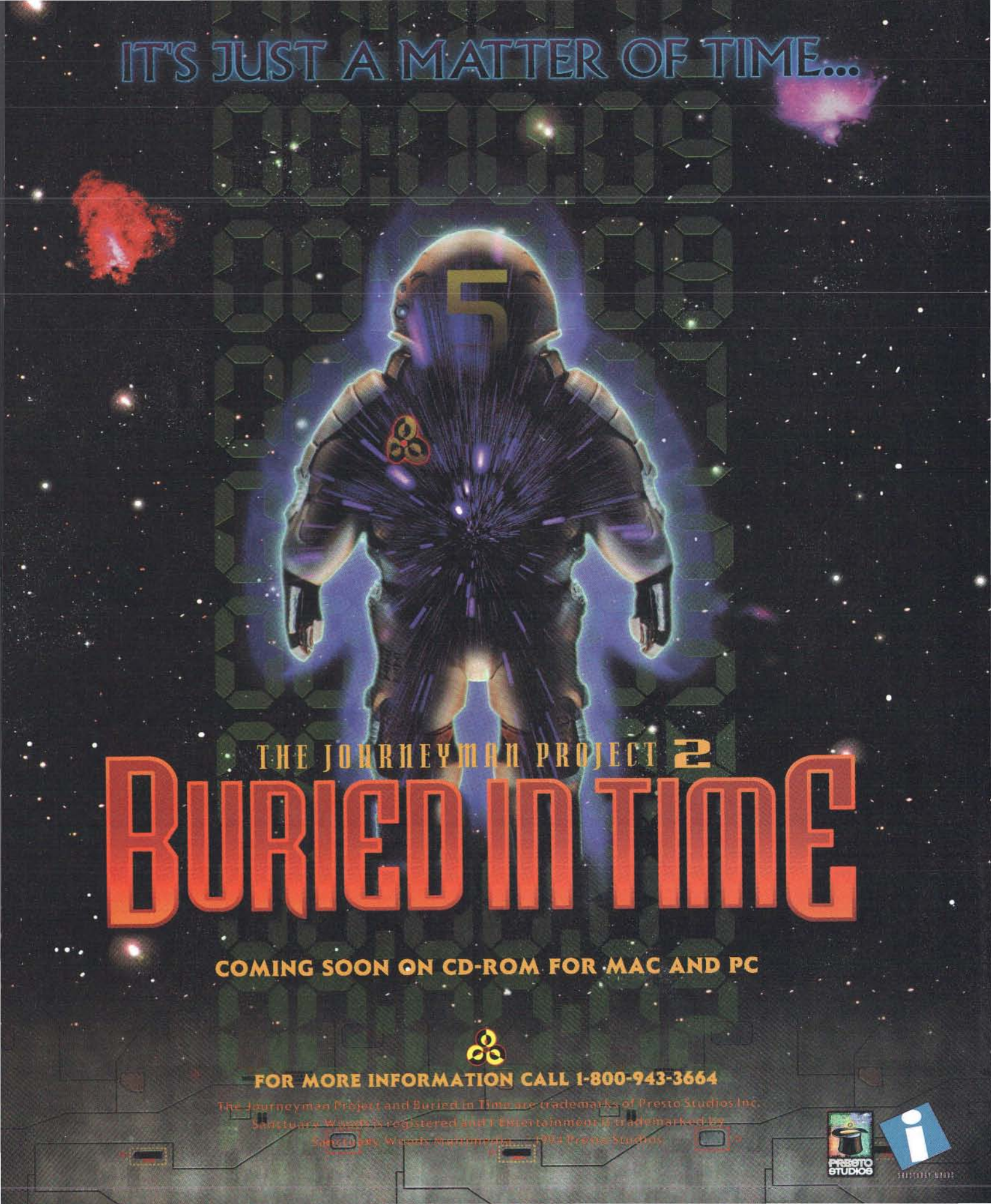
Say I'm looking for the latest Madonna single in digitized form; it costs a few dollars at an authorized store, but in an illicit market I could get it for a buck, or even for free.

So copyright law will continue in its traditional role of promoting markets for copyrighted goods on the Net, as it does in the tangible world. This does not mean, though, that the market will be unchanged. There is a vast movement afoot – the great and rapidly increasing abundance of information on the Net, far more than we can ever use – which may ultimately reduce our tendency to hoard information under the copyright laws. Information loses its value when there is so much we can't pick apart the useful data from the chaff. The valuable online services of the future will be those that bring order out of the chaos.

In some cases, the creators of valuable organizing tools will be able to control them under copyright, and their owners will profit. In many other cases, though, we will see a shift toward information services instead of information hoarding. For instance, it would not be surprising if much of what is sold today as "products" – recorded songs, books, films – become no more than cheap promotional tools for premium services, such as live online concerts and direct interactions between audiences and artists. Such new services and more will undoubtedly appear as we venture deeper online. In any event, the shift from information hoarding to infomation services will be based entirely on our increasingly desperate need to organize overabundant information resources. Killing off copyright law has nothing to do with it.

Each of us can now perform widespread copyright infringement without getting caught, if we're careful. However, none of this will make a hair's breadth of difference to most of those who wish to sell copyrighted goods in the electronic age because the traditional copyright system is fully Net-capable. We may eventually see a societal move away from information hoarding, but it will not happen because copyright law does not work. There will simply be more money in helping people use information than in metering the stuff out.

Lance Rose is an attorney and writer who focuses on the law of online communities.


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Follow the Money

By Anthony B. Perkins

Life as publisher of a technology business magazine may seem glamorous, but it sure doesn't line the old jeans pockets with cash. That's why I felt a new kind of rush when the editors of *Wired* slipped me a virtual million to start The Wired Interactive Technology Fund (TWIT$) with the instructions that it better give an average return on investment of 20 percent or I'd be out of a job – or at least out of a column. No problem, I thought. I'll spend my days talking to all the big dogs in technology. Just squeeze 'em that extra little bit, get some hot stock picks, and green bills will start sprinkling down from heaven.

All successful mutual fund managers have, of course, "an investment philosophy." So it seemed imperative to develop one that at least rang well before I started barking "buy," "sell," and "short." Having taken neither a philosophy lesson nor an investment class, I turned instantly to His Holiness, Roger McNamee of Integral Capital Partners, the pope of technology investment. "At the moment," said McNamee, "we are focusing on three themes: interactivity, mobility, and interconnectivity. It's very simple, really, because everything electronic is getting more interactive, more mobile, and is getting connected to everything in sight!"

OK – interactivity. First, let's put to rest my least favorite current myths. No, the entertainment and education markets will not somehow magically divide into two separate industries dominated by separate players. A guiding investment principal for the new fund will be to bet only on companies that are here and now. For this month, Electronic Arts is a solid bet; its enormous distribution muscle makes it the most stable franchise in the business. For the same reasons, I am excited about Brøderbund.

On the distribution side, it's becoming obvious that the CD-ROM and game-cartridge media are merely the training wheels for online delivery. Although America Online is often trashed within these pages, I spent a lot of time talking about digital information distribution strategies with AOL chief Steve Case on a recent junket in Barcelona. I remain a true believer in his consumer-marketing background and competitive nature. AOL's recent acquisition of Redgate, the Florida-based, bleeding-edge, interactive-marketing firm, offers just one more hint of Case's strategic vision. Redgate co-founder and CEO Ted Leonsis recently confided to me, "When Steve Case and I began talking, we saw how we could create a new medium that combines the traditional online service with interactive advertising and transaction processing."

Our short sell for the month is 3DO. Since writing my first draft of this article, 3DO has dropped, and I expect it to continue to drop. While Trip Hawkins is finding marginal success selling porn titles in Japan, he still needs a solid Christmas in the United States for investors to make a good return. We don't think this will happen, and 3DO will subsequently run out of cash with no place to turn.

TWIT$ would be remiss in not placing bets on a few top multimedia tool vendors. After months of talking to interactive content developers from Hollywood to Paris, it's clear that Silicon Graphics is the box of choice, and software tools produced by Alias and Wavefront are gaining an entrenched loyalty. C-Cube, the rapidly expanding producer of compression chips for multimedia systems that went public last April, is also an attractive buy.

On the mobility front, there are three safe bets: Motorola, Mobile Telecom (Mtel), and Compaq. Mtel and Motorola are locked in a sweaty battle to dominate the emerging two-way messaging-service business. "Mtel has a proven record with its very successful SkyTel pager service and should be the first to market with a two-way product," says Judy Owen, CEO of Wireless Access. I believe her, but there's enough room in the sky for both Mtel and Motorola to win. In the mobile-computer-device area, my heart's favorite is Apple, but with a Windows platform and commitment to wireless communications, Compaq is best positioned to be the market leader.

The current VC buzz concerns opportunities in funding Internetworking start-ups that are pioneering Ethernet switching and Asynchronous Transfer Mode (ATM) technologies. Bob Metcalfe, the inventor of Ethernet, founder of 3COM, and executive correspondent of *InfoWorld*, concurs with the VCs, but warned me that "It's still very, very early in the game." TWIT$ will therefore stick to the "here and now" perspective, and bet on switching and routing companies like Cisco Systems, Alantec, and 3COM. Doug Leone from Sequoia Capital, the VC firm that made a bundle as the sole pre-public investor in Cisco, bolstered my confidence by projecting that "the switching business should grow from US$50 million in 1994 to more than a $1 billion market by 2000."

There you have it. The first stock picks for The Wired Interactive Technology Fund. I'll be back next month to examine the fund's progress and provide a new round of insights into where the money is flowing in technology. ■ ■ ■

Company	Symbol	Action	Price Dec 1	Shares	Invested
Interactivity					
Electronic Arts	ERTS	buy	19.19	3,200	$61,400.00
Brøderbund	BROD	buy	34.75	1,100	$38,225.00
America Online	AMER	buy	41.50	2,800	$116,200.00
The 3DO Company	THDO	short	12.75	3,000	$38,250.00
Multimedia Tools					
Silicon Graphics	SGI	buy	29.75	2,700	$80,325.00
Alias Research	ADDDF	buy	23.25	3,300	$76,725.00
Wavefront Technologies	WAVE	buy	11.50	5,200	$59,800.00
C-Cube Systems	Cube	buy	18.50	2,500	$46,250.00
Mobile Computing					
Mobile Telecom	MTEL	buy	16.38	3,300	$54,037.50
Motorola	MOT	buy	56.13	1,600	$89,800.00
Compaq	CPQ	buy	38.25	2,000	$76,500.00
Interconnectivity					
3COM	COMS	buy	43.25	1,800	$77,850.00
Cisco Systems	CSCO	buy	32.25	2,500	$80,625.00
Alantec	ALTC	buy	20.00	5,200	$104,000.00
					$999,987.50

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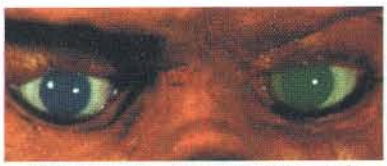
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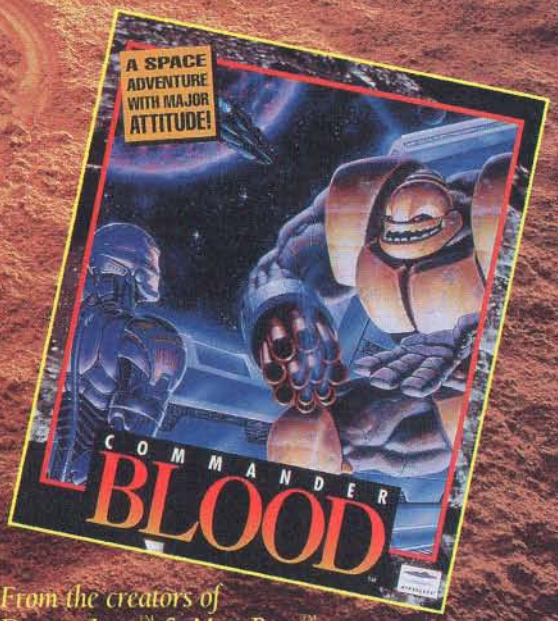


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The smartest telco CEO, Bell Atlantic's Ray Smith, reveals what really torpedoed his merger with John Malone's TCI, why the telcos are going to kick cable's butts (and where their real competition will come from), and precisely how the I-way is going to reach your home.

By David Kline

ALIGN AND

Point! Last year, *Wired*'s David Kline snatched an amazing interview with the cowboy of cable, TCI chief John Malone. The mogul's uncensored revelations about the collapse of his US$33 billion merger with Bell Atlantic Corporation – not to mention his audacious jest about shooting the chair of the Federal Communications Commission – ignited controversy (*Wired* 2.07, page 86).

Counterpoint! Now *Wired* has returned Kline to the gladiator arena, this time to the opposing corner – that of Ray Smith, CEO of Bell Atlantic. Clearly the most enterprising and farsighted of the telco leaders, Smith was the first to start construction on a broadband network, the first to win federal approval to offer commercial video dial-tone service, the first to win court permission to develop the company's own video content, and the first to begin shifting his once-stodgy utility to a more entrepreneurial footing.

Smith enjoys poking fun at his old monopolist image as much as anyone. On the white board in his office he wrote: "1) Buy AT&T 2) Sell Pennsylvania 3) Retire 4) Work for IBM (depose Gerstner) 5) Cancel subscriptions to all magazines and newspapers."

Here, then, is what Ray Smith, the titan of telephony, has to say about John Malone, the telecom wars, Jane Seymour (yes, Jane Seymour), and what the broadband network in your future is going to look like.

Wired: So, what's the plan? Are you going to buy AT&T, or sell Pennsylvania?

Smith: No, don't use that. I put that up just to amuse you. All we need is to have a rumor going around that we're going to sell Pennsylvania.

I can imagine. Even John Malone said that you telco guys are the real monopolists.

Yeah, in my career I've come to know a number of humble, one-shoe-over-the-other billionaires.

So you're not a monopolist, and you have no near-term plans to sell Pennsylvania?

Absolutely not.

I see.

We're gonna sell West Virginia.

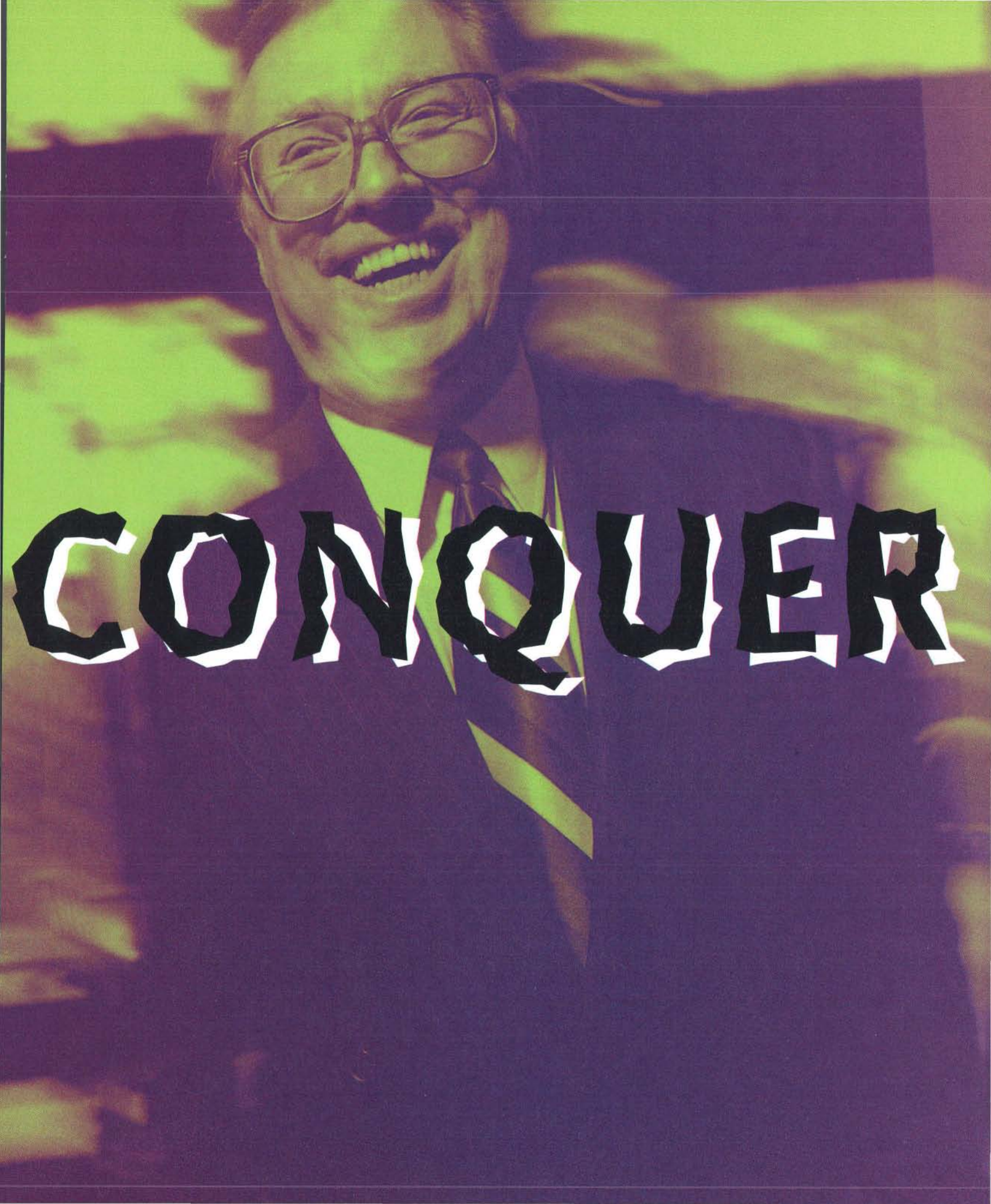
[Laughs.] Well, now that we've got that settled, can we talk about Bell Atlantic's aborted merger with TCI? People still want to know what really happened the day the biggest deal in American history crashed and burned.

You know what amazes me? There were only four people in the room that day, but there are at least twenty different versions of what happened. It's like the movie *Rashomon*.

Well, Malone said the merger was aborted because you

David Kline (dkline@aol.com) *and Daniel Burstein have written* The Living Room Wars, *to be published this fall by Dutton-Signet.*

NEIL SELKIRK


CONQUER

couldn't get your board of directors to go along with the deal – they were skittish about changing from a regulated utility into a high-growth company.

No, that's absolutely not true. The entire board was in favor of it. There wasn't a single voice against it. Let me tell you what *is* true. There was a struggle in the shareholder base. We have a million shareholders, and they are high-yield-oriented. We froze the dividend, and it frightened the life out of our shareholders. And our stock, which leaped for a while on the promise of the merger, dropped as the yield-oriented shareholders pealed away.

So, the struggle was really in the investment community. It was not a debate on our board about whether to change into a high-growth company versus a low-growth company. My cash-flow growth is faster than John's!

I'm not trying to say we didn't have cultural differences in terms of TCI being more entrepreneurial. But the issue was, how do we get the cash out of our company to complete the deal without scaring off our shareholders? If you cut the dividend too much, the shareholders leave, and the stock drops so low you can no longer do the deal.

But you knew you faced that problem going in.

I knew it going in. I knew it'd be a struggle that we'd have to handle with some sensitivity. Unfortunately, it became public. At one point, John was quoted as saying we'd have to cut the dividend in the future, and the stock dropped five points.

Why'd he say that?

[Shrugs.] He thought that was what we had to do. John was just being honest. But to say it like that is like lighting a match in a gas-filled room. Not that you aren't going to tell shareholders the truth. You are. It's just that we were trying to find less onerous ways of making the deal work financially. Why announce something like that before you know for sure?

You see, John's approach to this issue was like his regulatory approach. He didn't say, "Shoot the shareholders" – don't quote me on that – but he was saying, Let's just go cut the dividend. John, being the road warrior you pictured him on the cover of *Wired*, just wanted to get it over with. But that's not how you deal with regulation, and it's not how you deal with a large shareholder base.

I'm more of a builder. An architect. I like to do things one brick at a time. My view is, Align and conquer.

So what finally killed the deal?

John's cash flow went down. Remember, when we set the deal, John's cash flow was at $200 a subscriber and we agreed to pay him about 11.75 times cash flow. But there was a cash-flow test. If his cash flow were to go down, as it did after the FCC cable-rate rollbacks of February 1994, then I would give him fewer shares of my stock, which had a fixed price of $64 in the deal.

Now, by February 1994, because of the declining cash flow, the value of TCI stock was by then dropping close to $20 or $21. I was willing to pay something like $25 per share. But John still had it in his head that it was a $35 stock. That's just too big a difference.

In the final meeting, we kept trying to figure out some way to make it work. John said, "If I take this reduced number of shares, I'll never get my major shareholders to accept it. And there's no way you can give me the number of shares I need. You'd be paying 14 times cash flow." And I said, "You're right."

Finally, he said, "Well, we can't just sit around here forever." And I said, "Yeah, let's look at the press release and get this over with."

What's your strongest memory of that last meeting?

[Pause.] I guess it's the last words he said as we separated. He said, "Nice try, my friend."

You guys really like each other.

We do. We're both old techies, and we get along very well. John and I were just on a Networked Economy Conference panel together, and we were standing at the urinals talking about things, and Barry Diller comes in and stands between us. And Barry says, "C'mon, you seem like such good friends. Just split the difference."

[Laughs.] What does the failure of the merger tell us about the strategic-planning capabilities of big companies like yours? One day you're spinning together these huge deals, and the next day you're taking them apart and going about your business.

Actually, I think it's positive. It shows that although we had a good strategic idea in trying to merge with TCI, when the conditions changed, as they did, we were willing to pull back. You don't just stick to a deal out of sheer, cussed egotism when it's no longer good for the shareholders. Cutting mergers is a hard thing to do.

And you know what? If I could get the same deal today that I agreed to a year ago, I'd sign it right now. Right this minute.

What if Malone reads this in *Wired* and calls you up and says, "OK, Ray, you're on!"

I'd take it. Exactly as I signed it a year ago.

Gee, as a finder's fee I'd get something like $50 million! Of course, *Wired* would want a piece of that, no doubt. In any event, many now say the collapse of the merger shows that the info highway is way overhyped. What do you think?

There was a lot of hype before the merger. The media was full of it. But for all the hype, there was also a lot of naysaying.

Still, I do think the merger announcement moved things forward. The moment it hit, there was no way that anyone could say that it all was just hype, or that the whole notion of the info highway was silly. The naysayers were just swept away.

You mean, the naysayers in your company?

Not so much in our company. Remember, we were the first of the regional Bell companies to see it coming. We very consciously set out to prepare for it in 1990 when we filed the court case to change the Cable Act of 1984, which barred telephone companies from owning the video programming they delivered.

And you know, when we launched that court case, we offered it to all of the other telephone companies, including GTE. None of them saw any need to get into the video industry.

And the merger changed that?

It really began to change when we won the court case in 1993. Before that, there was not one single procurement by the other Bell companies concerning video. There was no support of ADSL [asymmetric digital subscriber line, a way to send data down a phone line]. There

"You don't just stick to a deal out of sheer egotism when it's no l

were no hybrid fiber-coax discussions whatsoever among the other phone companies.

Now, I happen to know there were battles within at least four of the seven Bell companies over whether video was practical. A lot of discussion along the lines of, We'll never be able to make it pay, We can't do it, that type of thing. They were in the "Yes, but" phase. Once the court case was won, that was the end of "Yes, but." They all called and said, We want to get into this. Even then, there wasn't critical mass in most of the telephone industry to move forward on video.

But the day after the TCI merger announcement, there was. Suddenly, video became a necessity. The top decks of all the Bell companies knew that, at the very least, they'd have to get into the video business because cable was going to get into the telephone business.

There was no argument any more. It wasn't whether we should do it, but *how* we should do it. The announcement changed the picture so much that the merger became less necessary for us. Because one of the motivations for the merger was to get enough scale to bring equipment costs down. But when all these other companies suddenly jumped in after the TCI deal with their own infrastructure investments, costs were going to come down anyway.

So while many debunkers, especially in the media, point to the collapse of the merger as proof that all this is hype, the evidence shows it moved things forward. It was like a demonstration atomic bomb. Of course, then it became not only conventional wisdom, but conventional wisdom times two. We were in hyperspace, and we were all going to have talking television sets by the end of 1994.

nger good for the shareholders."

And Time Warner's Full Service network in Orlando was going to be up and running in *early* '94, remember?

Yeah, they were saying they had solved all the technical problems. Well, sure, they solved the technical problems. But the set-top was $11,000! So now it's $3,000. Big deal. I mean, the issue is, can you do it at a price that people can afford, so it can be deployed in the real world?

Anyway, the merger announcement served its purpose. It moved things forward.

And its abandonment four months later kick-started the war between the cable and phone industries that we see today. What do you think about the conventional wisdom that says the telcos will probably lose 30 percent of their market share to cable-provided telephony services, while cable could lose 30 percent of its video business to the telcos? I mean, cable executives say that's fine with them, because their 30 percent is going to look a lot sweeter than your 30 percent.

Oh, for Christ's sake! This notion that cable companies are going to get 30 percent of the $100 billion telephone business, whereas we'll get only 30 percent of cable's $20 billion business – that's ridiculous. Bell Atlantic is not one business but 13 different businesses, most of them not subject to any real competition from the cable industry.

RBOCs get a billion dollars of our revenues from the federal government. You're saying cable's going to take our 25-year contract with the Pentagon? Nonsense! Cable companies aren't going to touch that. Or look at the Yellow Pages. If the cable companies offer local tele-

Ray Smith: The I-way, My Way

By Evan Schwartz

The typical American family has the tube turned on nearly every minute someone is home and semiconscious. The average adult watches between four and five hours a day. These statistics don't change from year to year and likely never will. In other words, no company is going to make money trying to get people to spend more time in front of the set. "Television is probably a zero-sum game," says Michael Lasky, director of digital production for Bell Atlantic Video Services Company.

So why has Bell Atlantic built a US$200 million "digital factory" in the edge city of Reston, Virginia? Why is the mid-Atlantic telephone monopoly declaring war on cable companies and parachuting into the supposedly zero-growth business of gluing people to the TV? When you visit this video supercenter, you begin to see the answer. This is ground zero for a much larger plan.

Bell Atlantic doesn't call this place a digital factory for nothing. It's an industrial-age metaphor for the most ambitious of information-age endeavors. On the crisp November day of my visit, the factory is still a work in progress. Wet-paint signs are everywhere, but the show is ready to begin. An analog source tape of a *That Girl* episode is cued up in a wall-sized bank of input decks – digital beta cams, VCRs, 1-inch reels and other media-eating machines. The raw material is refined into a clear stream of ones and zeros and piped into one of about a dozen production suites – small rooms packed with PCs as well as waveform monitors, audioscopes, vectorscopes, and other gear that looks like radar equipment. In these rooms, encoding engineers flip the bits until they are normalized, synchronized, aligned, and color-coordinated. Marlo Thomas has now been digitally enhanced for your viewing pleasure.

This is only the start of the assembly line of bits, for which your brain is the ultimate destination. Next stop is the squad of Silicon Graphics-armed digital artists who are breeding the new interactive viewing "environment," including onscreen venus, logos, and promos.

Then Marlo, the viewing environment, and all the other content piped in from around the world are compressed and channeled through thousands of black cables that snake under the floor, across the hall, and into a basketball court-sized data center. Sporting a white, raised floor with air conditioning vents, this room houses a network control center befitting a small airport. But most importantly, it holds a big, black nCube supercomputer fitted with 256 microprocessors as well as Oracle's multimedia database software and enough Gbytes of storage capacity to warehouse all the video that will be requested by tens of thousands of households in the Washington, DC, region.

For a viewer who has used a personal computer or played a videogame during the past five years, selecting something to watch from the Bell Atlantic system seems rather mundane. The user interface for the Northern Virginia market test of 1,000 households that was slated to begin late this winter or early this fall consists of five onscreen icons that customers can choose with their remote controls. In the center of the TV screen is a

shiny, happy sun face, welcoming viewers to Stargazer, Bell Atlantic's brand name for interactive TV. The sun face smiles and winks as customers make their selections. The other four icons allow viewers to choose a) movies, b) shopping services, c) children's programming, or d) "lifestyle" programs such as documentaries and how-to shows.

For now, the programming on this network travels at the relatively modest speed of 1.5 Mbits per second over ordinary copper telephone wires, using a digital-routing scheme known as ADSL. The data rate means that the picture is no sharper than today's cable reception, says Lasky. The set-top box for this test, made by IBM and a consortium led by DiviCom, gets plugged into an ordinary telephone wall jack. It will cost about $300, based on a projected production of 1 million, and customers will pay for it in small monthly rental installments. While watching TV, customers can still use their phone lines as before, even while pausing, rewinding, and fast-forwarding through movies, which will cost $3 or $4 per viewing.

If all this doesn't sound as revolutionary or alluring as the info highway hype you've been hearing, it isn't meant to be. Bell Atlantic has relatively modest but concrete aims. A recent poll of 500 customers throughout its six-state service region found that 46 percent of cable subscribers said they would dump their cable company if a similar service were offered by their phone company. If a store-sized library of videos-on-demand were thrown in, 56 percent said they would switch. And a full 61 percent said they would buy in if the combined cable and video service were 10 percent cheaper than they are now. Over the next few years, Bell Atlantic wants to take these customers at their word and win over all that business. Or at least as much as they can before their local telephone monopoly starts to erode.

Then the real gambit kicks in. "It's a Trojan Horse," says Larry Plumb, director of communications for Bell Atlantic Video Services. By becoming the first company to supply both telephone and entertainment service to tens of thousands, perhaps millions, of customers, Bell Atlantic is aiming for a scale no one in the nation is able to match. The company is investing $11 billion over the next five years to make sure a full-blown, blazingly fast, fiber-optic network is in place by the time demand for more advanced interactive services kicks in.

But what worries many cable executives is that phone companies like Bell Atlantic won't be offering these things, or anything else really new, for many years – just spending billions to cut into an existing market. "There is another potential monkey wrench. The movie studios typically don't release their biggest hit films to pay-per-view cable until those movies have been in video stores for 30 to 90 days. If Bell Atlantic cannot negotiate a contract to get those movies sooner, people will continue to flock to their local Blockbuster and other video stores for the most popular new releases.

That's one reason why Bell Atlantic showed up at the Hollywood doorstep of Michael Ovitz last fall. The head of Creative Artists Agency will use the buying clout not only of Bell Atlantic but also of Nynex and Pacific Telesis Group. These companies have serious cash, and Ovitz doesn't mind getting a percentage of all deals.

The goal is not only to buy rights to movies, but also to buy minority stakes in programming networks, much like Nynex's investment in Viacom. The result would be a new content empire akin to Liberty Media, the programming arm of TCI.

The Reston supercenter is already equipped to handle whatever magic Ovitz can conjure up. Gleaming but vacant new video-production studios stand ready so new programming can be created on premises, or pumped in over high-speed lines for 30 million households in six of the top seven media markets in the nation: New York, Boston, Philadelphia, San Francisco, Los Angeles, and Washington, DC.

The Bell Atlantic executives call the whole process "virtual creation" because they expect creative people all over the planet to work together zapping new movies, TV dramas, videogames, sporting events, and educational programming to the factory.

Perhaps the biggest question is: Who ends up paying for all of this? Bell Atlantic executives realize that all the costs cannot be shifted to subscribers. Indeed, research by Hewlett-Packard Company and others getting into this business shows that consumers are willing to pay only $5 to $10 per month for all the new interactive services anyone can think of. That's why Bell Atlantic is working on advertising schemes to generate revenue.

Bell Atlantic: set on creating a content empire.

In part, these ideas center on taking micromarketing to absurd levels. For instance, if *Ace Ventura: Pet Detective* is exceedingly popular in a certain zip code or even just in a certain household, the viewers might be targeted with personalized ads for pet food. Or when you watch an Indiana Jones movie, it could include ads for the type of clothing he is wearing.

Other ideas involve the video mall concept. The company has already signed deals with three giant retailers: Lands' End, Nordstrom, and J. C. Penney. Bell Atlantic would receive transaction fees every time a customer purchases something. For now, the user interface for interactive shopping is fairly crude. The company is at work developing more compelling ways to present merchandise.

What's clear is this is not so much an info highway, but an entertainment highway. "It's predominantly entertainment," says Lasky. But, he says, that's what the people want. They want to watch what they want, when they want. And they want the convenience of ordering everything from pizzas to power tools from their sofas.

Of course, Bell Atlantic could be wrong. It's possible there isn't enough demand for interactive television services to justify the costs. Presumably, we'll know either way by the summer of 2001, when Bell Atlantic's lease for the digital factory building in Reston is up for renewal. ■ ■ ■

phone services, is that going to affect our Yellow Pages business? And are they going to compete for our life-line services?

Oh, I'm sure they're dying to get their hands on that!

Right, we're quivering in our boots waiting to see a cable company come into New Jersey and offer local phone service for $6.50. So the more you look at it, the more the percentage of our revenues that are really subject to cable competition keeps shrinking. Of our $13 billion in total revenues, only $4 billion of that – the consumer business – is subject to competition from cable companies.

Now, the cable companies in our territory also have about $4 billion in revenues. But while we cover 100 percent of their customers, they cover only 60 to 70 percent of our customers (the telephone-using homes that subscribe to cable TV service). So there is only about $3 billion they can try to get their hands on.

But how successful are they likely to be? Consider that Philadelphia, for example, is served by maybe 10 or 11 cable companies. Even inside the city there are four different cable companies. Four!

Now you're telling me a consumer is going to subscribe with a cable-phone service that serves only one section of the city? That's going to be a pretty hard sale. And what about power? Remember, when the power's out so's your cable phone!

So, this 30 percent versus 30 percent.

It's wrong. It won't be dollar-for-dollar. It'll be 10-to-1 in our favor. I would say that by 2000, we'll have 50 percent of the cable TV business – no doubt about it, which is why some cable companies are in a panic. Meanwhile, the cable companies won't have even 3 percent of telephony revenues in their best market. Not in their best market. It's just not going to happen.

But isn't your real concern here not so much that cable companies will take a big chunk of your total revenues, but that they'll cherry-pick your most profitable businesses, like your $3 billion-plus local access services?

We've already got competition there. No, cable is not where our real competition will come from. The competition's going to come from AT&T and from wireless, not from cable companies reequipping their ancient and crappy systems.

But now TCI and two other cable firms have hooked up with Sprint Corp. to bid on wireless personal communication services spectrum.

Bidding is one thing. Building a truly robust and competitive service is another.

Well, *your* wireless business has certainly gotten more robust lately. By combining with Nynex, AirTouch Communications, and U S West, you've now got the biggest wireless footprint in the country. But what about the failure of your talks with MCI? Doesn't that leave you without the sort of national brand name you'll need to compete with AT&T, or even Sprint-TCI?

For us, the most important thing is the footprint, not the brand name. We estimate we need a footprint that covers somewhere around 150 million potential customers to give us the scale to compete with AT&T.

As for the brand, we can create it. It'll cost money, and it won't be as quick as if we had MCI with us. But we can create a national brand that's up in the 60 percent range within a year in terms of recognition, maybe up to 85 percent in two years.

So have you given up on MCI?

MCI needs a wireless strategy. They have to be connected with a company that has a wireless presence. As for what may or may not happen, that certainly isn't going to be talked about today.

You've laid out some of your competitive advantages over the cable industry. But you also have some disadvantages, don't you? For instance, whereas cable firms have already laid their coax – 80 percent of the cost of building the network – don't you still have this massive construction job in front of you?

We've been equipping our network for years now.

But I'm talking about laying coax, especially that "last mile" to the home. Look what happened to Pacific Telesis in Milpitas, California. When city officials there saw that PacTel planned to dig up 60 miles of city streets and disrupt businesses for months – just to lay coax to 1,000 homes – they refused to grant construction permits unless PacTel forked over $1 million in remuneration. And that's just one city. So how easy is it going to be for the phone companies to go into thousands of towns and cities nationwide and get similar permits?

Well, I think Milpitas was an anomaly. We know how to build so you hardly know we're there. We have a construction permit for Dover [the township in New Jersey that is the site of Bell Atlantic's first commercial interactive video service]. If you polled the people in Dover and asked, "What cataclysmic thing is going on here?" they wouldn't know what it was.

Maybe what happened in Milpitas was an overreaction by the city council or something. In any case, we know how to build in a way that would satisfy any community. It can be done with care, delicacy, and with a little bit of explanation. In Morris County, New Jersey, it's like the Persian Gulf War or something, and everyone's waving Bell Atlantic flags saying, "Please come! Please come!"

Cheering, no less?

Sure, because they see us as finally bringing decent cable TV service. We've had people calling us, asking how soon they can sign up for our cable service.

I mean, look. I'm in Montgomery County, Maryland. Just this week, my cable TV service has been out for three days. Fortunately it wasn't out on Monday when the Steelers were on, but it went out Tuesday, and today's Friday! We get terrible cable service, really lousy service. And everybody says so.

But what's going to happen to your service as you make Bell Atlantic leaner and meaner and more competitive? Look what's happening with U S West. It's been reengineering, laying off workers, and cutting costs to become more competitive with the cable companies. And guess what? Colorado regulators have now charged them with major violations of state service guidelines because their customer service has gone down the tubes.

"By 2000, we'll have 50 percent of the cable TV business."

Well, they may have gone over some line, but.... Look, just because U S West has a couple of problems, that doesn't compare to every cable company in the country being the worst service provider in the community. I mean, I don't remember my telephone ever going out of service.

We have good service and I don't see that changing. We have such a competitive advantage over cable because of our service reputation that we'll get 15 percent of video market share easily just by putting out our shingle.

You know, all this downsizing raises an interesting point: people say the info highway will create jobs, yet to compete in building it, the telcos have become the biggest job destroyers in America. In fact, collectively, the Bells have announced more than 80,000 layoffs in the past year. [Protesting Bell Atlantic workers were sent home without pay one day last November for wearing T-shirts describing themselves as roadkill on the info highway.]

Like you said, it has to do with competition, which is coming into our business. We've already streamlined, but we still have a way to go – and so do the other RBOCs – to meet the ultimate competition. So that's what you're talking about. That's the downward pressure on the work force.

But we think that after these downsizings are done – and when the market begins to develop fully in 1996 – you're going to see a lot of hiring going on. The building of the superhighway will act as an upward pressure on the work force. There'll be a great expansion to build all these new interactive services.

So we see a short-term need to get our costs down. Long term, in 10 years, we're going to be a much bigger company.

Well, you certainly sound like you're ready and willing to take on all competitors. So why do you think Senator Fritz Hollings, Representative Ed Markey, the Consumer Federation of America, and even Vice President Al Gore put the blame for killing the 1994 telecom bill – which would have opened communications markets to greater competition – squarely on the regional phone companies?

I don't think that's fair at all. I think the Senate just ran out of time.

But wasn't that because some of the telcos – notably Bell South – just wouldn't compromise on certain of the bill's provisions regarding the opening of their markets to competition? Whereas your company and other Bells were much more willing to work out a compromise?

I think that's pretty accurate. We certainly were more willing to move forward with that bill and negotiate some of our differences in conference. Some of the other telephone companies felt it was too dangerous to do.

Ultimately, does it matter whether there's a telecom law in 1995? I mean, you seem to be moving forward anyway to build out your network, develop programming.

It does matter. We've got to get these barriers down. We've got to get into full competition in our business and in long distance. We obviously are already in the cable business (because of the 1993 federal court ruling allowing Bell Atlantic to offer video dial tone).

So that side of it isn't important to us. But we have to open everything up to expand the market. This Balkanization we have now is causing dislocations in pricing and so on that are unnecessary. The market won't expand the way we want unless we have full and open competition in all areas.

Let's talk about what precisely this network is going to look like. You mentioned earlier that you saw yourself as a builder, an architect, rather than a John Malone-style road warrior. So sketch it out for me. What's your grand plan? What's the blueprint for your network?

It's going to be built differently in every town. That's the part that hasn't been captured yet, the unspoken story. The way it's been reported to date is that we are all going to put out hybrid fiber-coax and connect it to a so-and-so with a micronet. Like there's a grand plan.

Of course, that's ridiculous. It's that old manufacturing model, like you create one automobile design and then make 100 million cars that all look the same. But that's never how things of this sort are deployed. It's going to be quite different from some great, grand plan.

Here's how it's going to be built: There are five different technologies that we'll use to provide video services in competition with cable companies. The first will be the fiber to the curb, which is the approach taken by companies like BroadBand Technologies. This is what we're going to do in Dover.

"We've already streamlined, but we still have a way to go –

Your original ballpark estimate of the cost per home was $1,200. Is that still your figure?

It's probably about $900, including the drops into the home, but not including the cost of the servers and set-tops. And once that kind of technology gets ordered in larger volumes, we'll get down well below that number.

For fiber all the way?

Fiber all the way to curbside, with two lines then going out to between 20 and 30 homes. One line will be coax and carry video, the other is twisted pair for voice. Clearly, that's the preferred architecture. It's switched, digital, fully interactive, and you get a tremendous reduction in maintenance expense and an improvement in service. So that's one way.

Number two is hybrid-fiber coax, where we run fiber to a neighborhood hub and then coax from there to a few hundred homes. In some locations, this will be the preferred solution, especially where the interactivity is not expected to be as robust, or where the demographics of certain areas demand lower costs.

Today's price for that?

Maybe a couple hundred less than for fiber to the curb, but we're not so sure about that anymore. Be sure to let *Wired*'s readers know that these estimates are based on certain caveats and assumptions about early roll-out volumes, rather than full-blown nationwide deployment.

The third approach is ADSL. When you see what we're doing with it, you'll see that it's not an interim technology – at least not in the sense that it's second-best or doesn't work well. It has excellent quality. You can do the virtual VCR over it. You can fast forward and back, and you can have a whole batch of channels. It's server-based. It's digital.

But it is interim in the sense of being a transition technology, right?

Yeah, transition. That's a much better way to say it. It's a market entry kind of thing. It doesn't require conditioning the whole plant. It doesn't require big switchers or anything like that. It's modular. You go in house by house, and if people want it, you just stick in a circuit pack. When you get enough people in the neighborhood who want interactive services, then you bring fiber to them. Pull out the ADSL circuit packs and bring them out to a more remote area. They're reusable hundreds of times, so it's an interim technology that will be with us for 40 years.

Then what's limiting about it compared to fiber?

The cost is higher per house.

The cost of ADSL?

It's higher, yes, for each house. But remember when you cover a whole batch of houses, not every one of them takes cable television. When you do ADSL, each house costs more, but you do it only after the sale is made.

But isn't the level of interactivity different?

There's a big difference between that and full fiber to the home. A big, big difference. It doesn't give you infinite channels and infinite interactivity, but it does give you video-on-demand and home shopping. And it gives you excellent picture quality and good production values and our Stargazer user interface.

What about live broadcasts, live sports?

Well, as currently deployed, no. It's 1.5 Mbits per second. But future versions of ADSL will carry 6 Mbits a second. That gives you live broadcasts. It'll give you everything except the gee-whiz levels of interactivity.

Then the fourth approach is wireless cable. Twenty-eight GHz is working, and it's great. And remember you're talking about antennas that are small enough to be pasted on a window. You paste it on and put in your telephone jack, and you now have video. Of course, it's not applicable to every location and every terrain.

Direct broadcast satellite is the fifth approach. And these will all be integrated, so if you're the customer, you can say, "Yes, I'd like your telephone service and your wireless cable TV service." Or you can say, "Give me ADSL service," or whatever. It'll depend on your location, how far the engineering and construction of the network in your area has developed.

Do you think eventually there'll be one common architecture?

There will be. But I can't predict whether it'll be fiber-to-the-curb or fiber-to-the-node plus coax. But probably those two will be the most common.

But who knows? Remember, the capacity of wireless cable 164 ►

and so do the other RBOCs."

Bell Atlantic's Network

■ **Initial plan calls for two systems: one a hybrid fiber-coax system (HFC) in the Baltimore, northern New Jersey, Philadelphia, Pittsburgh, and Hampton Roads (Virginia) areas; the second a combined HFC and asymmetric digital subscriber line system in the Washington, DC, area.**

■ **Includes a "will carry" proposal to make transport available without charge to local broadcast as well as public, educational, and governmental programmers. These channels would be available along with programming of all video-information providers. Customers will not need a set-top box to receive these local channels if they have a cable-ready television set.**

■ **Calls for passing of approximately 3 million households and businesses in three years.**

■ **Plans to serve diverse urban and suburban areas – communities consisting of 36.2 percent minorities, as compared with 23.8 percent minorities in Bell Atlantic's overall territory.**

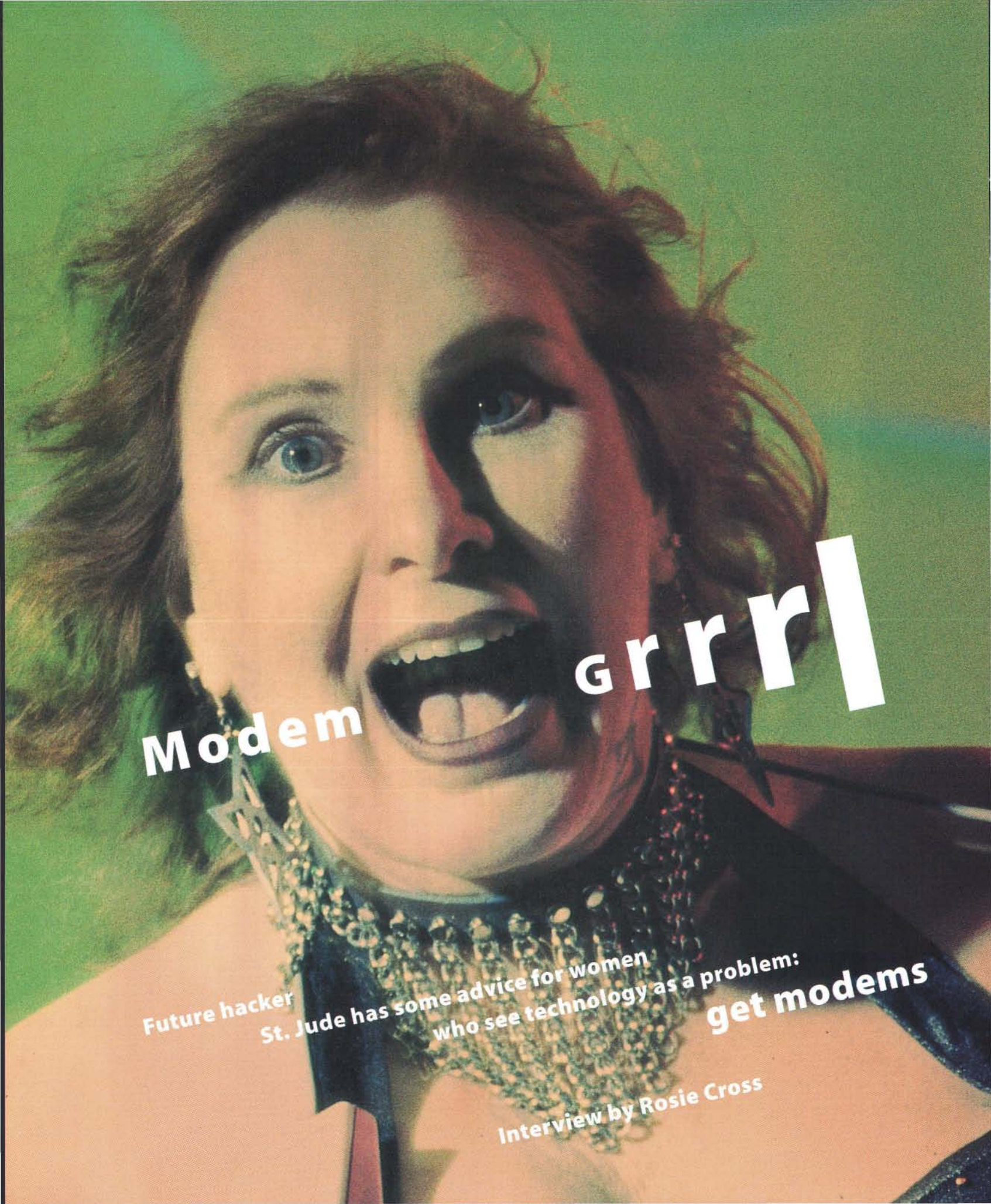
■ **Plans delivery of traditional video programming, on-demand services such as movies, and advanced interactive services such as home shopping, educational and health care services, and connections to computer networks.**

■ **Anticipates 497 to 675 channels on HFC systems including:**
- **23 to 37 analog broadcast channels;**
- **188 digital broadcast channels;**
- **272 to 464 digital pointcast channels that deliver the programming subscribers choose when they want it.**

■ **Provides digital capacity to affiliated and unaffiliated video-information providers on a common-carrier, nondiscriminatory basis. Also provides telephone exchange and exchange access services over each system. Telephone service will be added to the HFC systems beginning in 1997.**

■ **Requires Bell Atlantic's own programming affiliate, Bell Atlantic Video Systems, to request capacity on the systems under the same conditions and terms as other programmers.**

■ **Ensures that costs of providing video dial-tone service are not borne by telephone customers. Separate accounting records will be kept for costs associated with video dial-tone services. The break-even period for this new network is expected to be less than 10 years.**



Modem Grrrl

Future hacker St. Jude has some advice for women who see technology as a problem: **get modems**

Interview by Rosie Cross

Wired: What do you think about feminism and technology?
St. Jude: I think tech will solve all our problems, personal *and* scientific. Girls *need* modems.

Do you think women-only electronic salons that allow women to "gag" dweebs, dorks, and cyberbores are important? Or do you think the imposed "free speech" climate of the Net prevents control of some of the more abusive attacks directed at women, poofs, dykes, and people of different cultures?

Hanging out with nice people is nice. But I don't want to sit around in the politeness ghetto all the time. Hanging out with nasty-ass bigoted male teenagers is also good, if I can learn from them. I may pretend *I'm* a gay snotty male teenager myself – and why not? Particularly if I can turn somebody around with my expressed deviant opinion. (I am a gay snotty male teenager, now that I mention it.) Sticks and stones may break my bones, but words on a screen get at me only as much as I allow them to.

We accuse the patriarchy of constructing the spaces and language we use and occupy. Are American female academics *ghettoizing* these spaces, entrenching their *class interests* and setting themselves up as cops at a block party for the educated élite? Always on the beat for a bit of information, and overseeing what is said, to whom, and how it should be said?

Like a backhanded censorship? John Gilmore of the Electronic Frontier Foundation has said what may be the quote of the year: "The Internet treats censorship just like any other glitch: it routes around it." To use the language of the academics: The discourse is propelled by desire. Love laughs at locksmiths. So we'll talk about what we love to the people who can hear us – and if people keep on bullying us, after a while we'll find another trysting spot and leave the cops to themselves. We always have to drive the so-called infobahn defensively. Whether we're set upon by zealots or bigots or abusively correct politicos, we have to learn to defend ourselves.

Any kind of attack online calls for martial arts – aikido may be best. Use the enemy's strength against them harmlessly, but martial all your arts. So: learn to fight! Cyberspace is better than an acre of warm tapioca for a tussle. (I see no bruises here.) This is the best training ground for women; we may start 10 down in a physical fight, OK, but the keyboard is the great equalizer – *better* than the Glock .45. And combat on the Net is like Basic Training. The lonesome 14-year-old girl that I used to be could have managed her life a lot better if she'd been through this kind of boot camp.

Is the Internet safe for women? Is virtual rape possible? What could women do to these virtual rapists if they caught them – what would be a suitable punishment in data space?

Keep in mind, in cyberspace *everyone* can hear you scream. There was a woman crying virtual rape on LambdaMOO. It's a game, lady. You lost. You could have teleported. Or changed into an Iron Maiden (the spiky kind) and crimped off his dick. But by playing it this way, you've *really* lost. Because the MOO's also a social space, where you can meet people with *real* cultural differences – like Klansmen – and make them respect you as a woman, as a dyke, as whatever. Toe-to-toe, you may change their prejudices forever. My gay buddy says he's battled people this way for years ... he's an online warrior for civilization, yes. Ignoring people until they go away changes nobody's behavior, and it certainly doesn't change their opinions. Cries for niceness don't make it. Toughen up! You're dealing with people here, and primates act better when you stand up to them and give them a reason to respect you. I hate this waaaah-I'm-a-poor-sensitive-weak-woman-protect-me shit. This kind of stuff generates *more* contempt for women. So fuck niceness!

Apparently the women's conference areas on the Internet are being taken over by men. A lot of people feel this is men trying to become more feminine, to understand the female psyche. Do you think this is true?

How do you know they're men? I'm no lady, darlin'. How do you know I'm not a man? How are you going to let only genuine gyno-type double-X, Barr-body bearing, real virtual women into your virtual salon? As those adventure games put it, "I see no genitals here." If they say they're women, I say they're women, and should be treated just like the rest of us – badly.

Anyway, I think it's touching that men should become transsexual moles to try to understand women this way. It may be that this is the only way the alien sexes can honestly converse – when they're bodiless, nothing at stake, behind the masks of their pseudonyms.

Online you can learn to be fearless, you can afford to be bold. I've found myself saying things on the telephone that I wouldn't say face to face. The Net subtracts even the human voice. When you've got nothing, you've got nothing to lose. I can play amazing pranks, or I can do something even more outrageous: I can be honest. Say stuff so personal and real that my mind boggles to think about it now. This could be a breakthrough for humans learning about humans, not just men and women learning about each other. Sounds OK to me.

If you had a word to describe what you do when using this electronic medium, what would it be?

I'm a future hacker; I'm trying to get root access to the future. I want to raid its system of thought. Grrr.

If you could design a machine, what would it feel, look, and act like? How much grunt would you give it, and would you let it wear your black leather jacket?

Machines disappoint me. I just can't love any of these wares, hard or soft. I'm nostalgic for the future. We need ultrahigh res! Give us bandwidth or kill us! Let's see the ultraviolet polka-dot flowers that hummingbirds see, and smell 'em like the bees do. And crank *up* the sensorium all across the board. ■ ■ ■

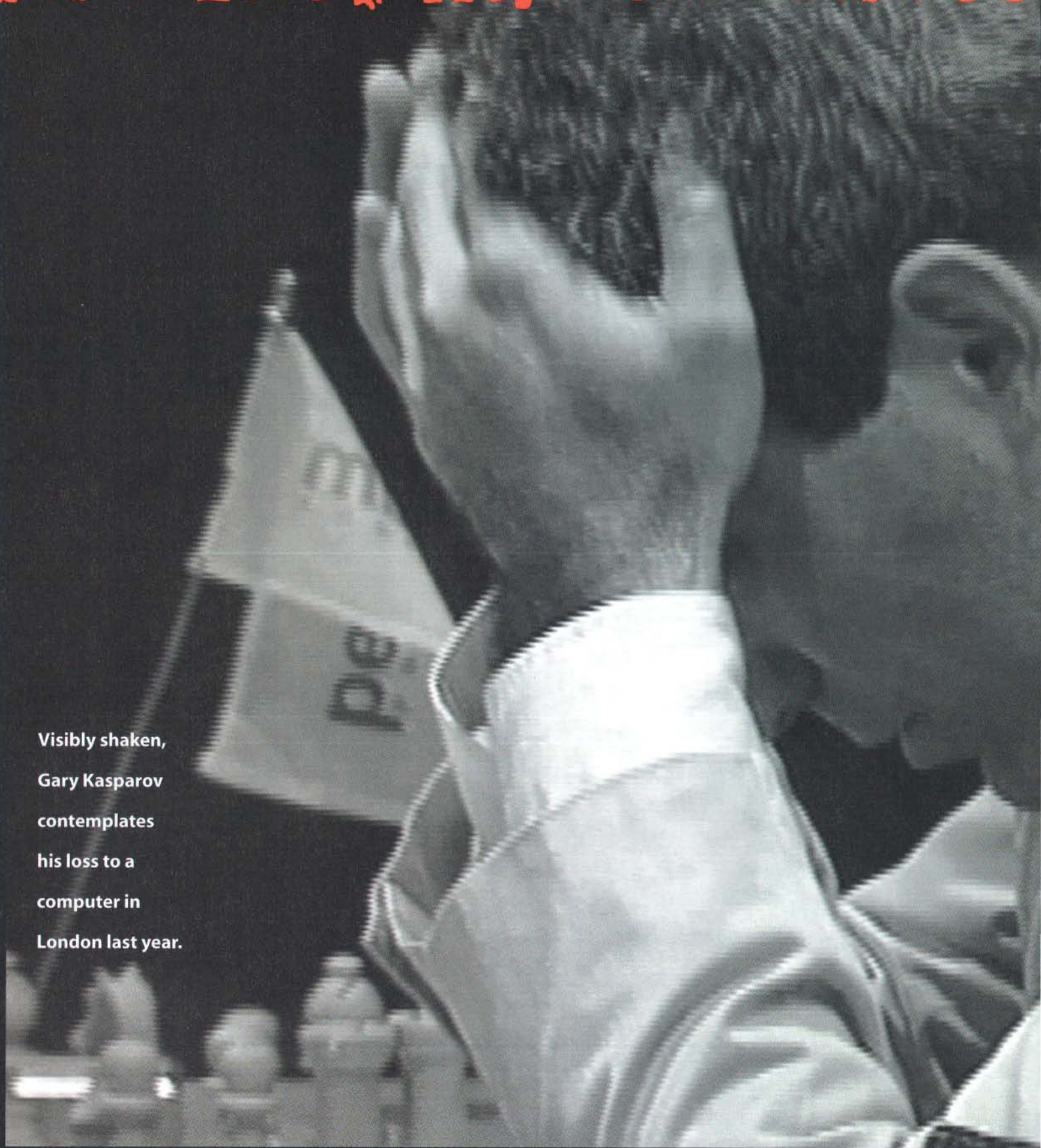
Jude Milhon is a hacker. St. Jude, as she is known, has been messing with code since 1967, when she taught herself Fortran and assembly code for the 1440. Once a Unix programmer, she "speaks C++ without an accent." Starting in 1973, long before CompuServe or easy access to the Net, Milhon was a member of a "lefto-revolutionist programming commune" in Berkeley, California, that created the legendary Community Memory project, the first public online computer system. She is a charter member of the cypherpunks – a term she coined.

Rosie Cross interviewed the take-no-prisoners programmer via e-mail between Cross's home in Australia and St. Jude's in Berkeley, California.

Rosie Cross is a freelance radio producer, writer, videomaker, and self-proclaimed geek girl who lives in Sydney, Australia.

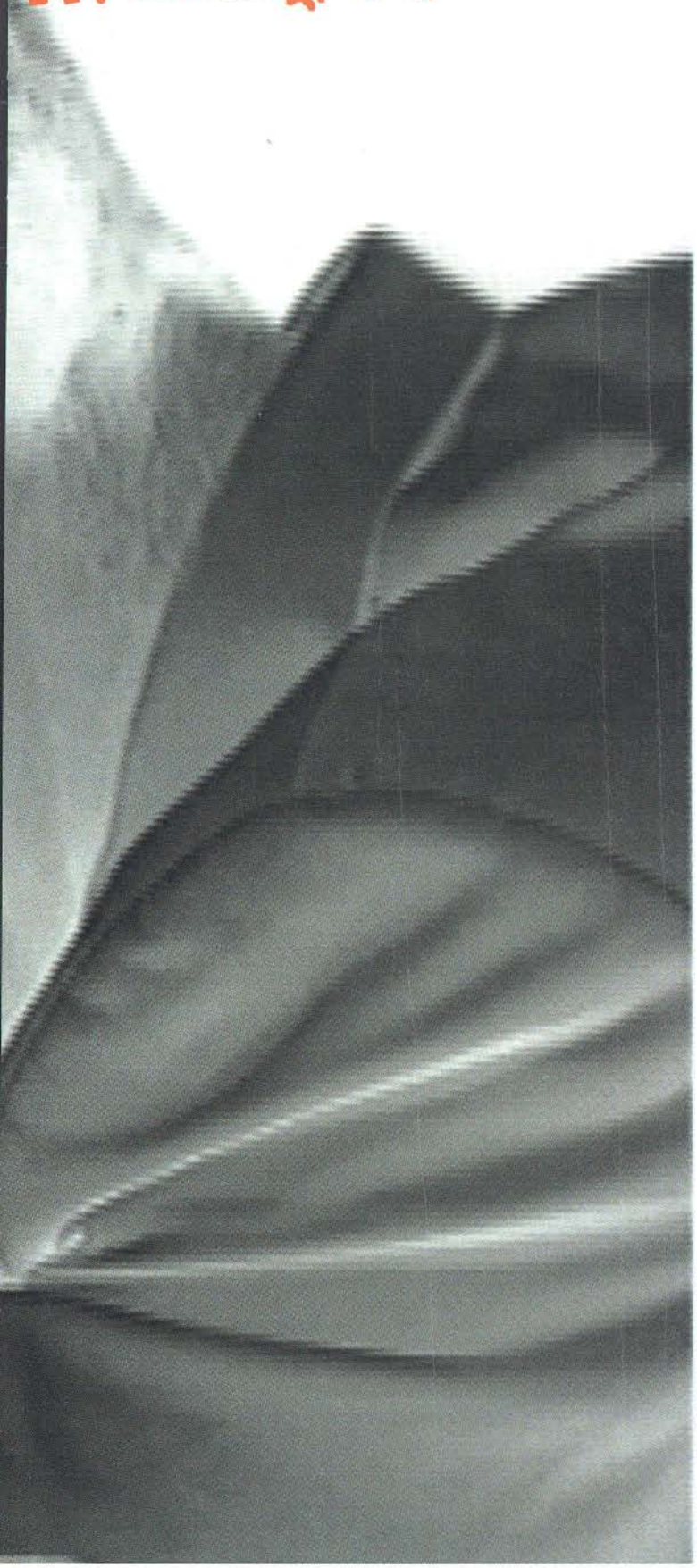
HENRIK KAM

The Last Human Chess



Visibly shaken, Gary Kasparov contemplates his loss to a computer in London last year.

Master



VIDEO STILL: SPORTS BUREAU INTERNATIONAL

On May 20th, 1994, in Munich, two minutes after beating his eighth human in a row, Gary Kasparov blundered. The reigning world chess champion sat down in front of a computer monitor. He had so far beaten every computer that had ever challenged him; as usual, he was confident he would crush this opponent. Strategy in mind, brow knit, he moused his moves in a blur.

He started strangely. "E3. It's a good move," recalls Kasparov with a sheepish smile. But conventional chess wisdom held that moving his king's pawn to E3 was a weak first move – unless, says *New York Times* chess columnist Robert Byrne, "you know what your adversary is going to do wrong." And Kasparov knew. He was playing Fritz3, some new software designed to beat the 17 grandmasters at the Intel-sponsored blitz chess tournament in Munich. And the man behind this computer chess-playing machine, Frederic Friedal, admits he made "a terrible mistake." He had let Kasparov practice on Fritz3. Kasparov memorized what Fritz3 did wrong.

After Kasparov's initial E3 move, the following three moves by each side proceeded exactly as he had envisioned. And then he played into queen's gambit accepted, a classic series of opening moves that strongly favored his white pieces. Here again, Kasparov knew what moves Fritz3 tended to make. This allowed Kasparov to play out queen's gambit accepted in a blur of automatic moves, saving him precious time within his six-minute limit. (In deference to the fact that he was playing a computer, tournament organizers had granted him one more minute than the usual five allowed in games of blitz chess.)

First, humans found out the world was round. Then they discovered that they were like the rest of the animals. Now they're about to suffer the ultimate humiliation: they are about to learn the hard way that their vaunted brains are no match for a machine. By Jeffrey Goldsmith

Opening games are critical setups that often determine who wins. To baffle opponents, grandmasters create new, unexpected openings not found in chess literature. Kasparov expected "an easy game," from his rather weird first move.

But in Munich, Fritz3 also played weird.

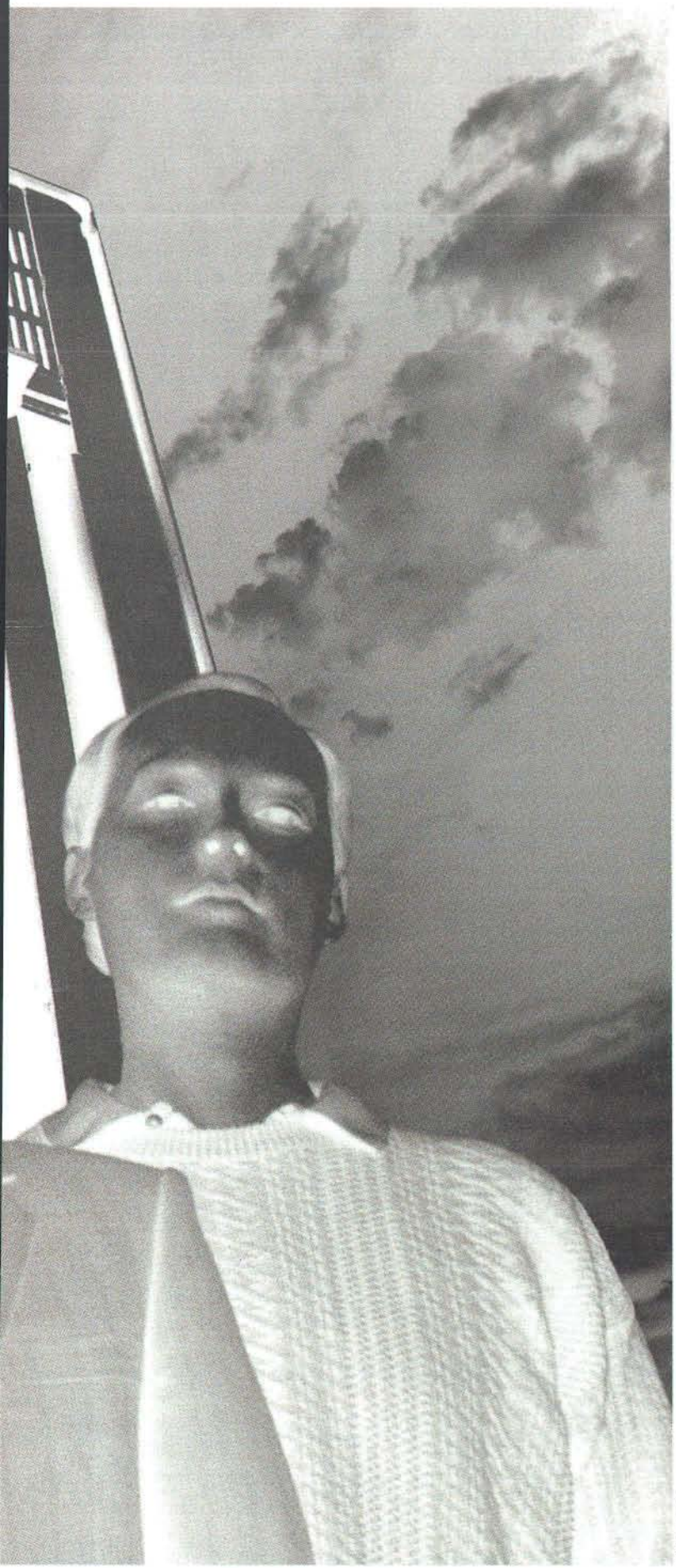
It counterattacked. Exactly as Fritz3's developers had planned, the board became a web of pieces attacking pieces. Kasparov needed time to understand the mounting complications, but blitz affords *no* time.

Kasparov missed a move (move 15) that would have won him the game. Professional Chess Association commentator Maurice Ashley said of the mistake: "For him to have missed this move is like Michael Jordan missing a layup totally open under the basket." It was a mistake so glaring that experienced players gasped when they saw it.

Jeffrey Goldsmith (wordz@panix.com) *plays the game of writing fact and fiction from New York City.*



They like to win: IBM's Joseph Hoane, Feng-Hsuing Hsu, and Murray Campbell think Deep Blue will beat Kasparov next year.



JAMES PORTO

Then, minutes later, Fritz3 lost a piece; for one moment the endgame looked – superficially – fairly even. In an endgame, the board is almost empty, which makes deep calculation easier for humans. Running out of time, Kasparov hurried his bishop across the board, but had he moved just one square rather than three, his would have made a better attack, one that may have saved the game.

Fritz3 didn't know Kasparov had blundered for a second time – as chess software goes, Fritz3 is not the smartest – but it knew what to do next: take Kasparov's pawns and move toward his side of the board. The result: Kasparov would be slain by what he calls "the Silicon Monster." Glimpsing his impeding demise, he angrily resigned.

Kasparov had never before lost a tournament game against a computer, and he played Fritz3 four more times that day. During each of those successive games, the 16 other grandmasters who made it to the finals in Munich cheered as they watched their champion avoid his previous misstep and trounce the machine. But each victory was tainted by Kasparov's initial loss.

"In blitz, there's too much inner pressure on any player," Kasparov later said with the tone of someone who has just stubbed his toe. The greatest pressure of all is that computers can see more deeply into the endgame than humans can – and they see into it *better* than humans, with terrifying accuracy. Exactly when accuracy is of utmost importance.

Kasparov does not think a computer that plays like the best human player will ever be possible, but he does not explain why he thinks so. He can only express his dismay at the idea: "Imagine a machine of that type. It means we not only abandon chess, but also music, literature. We're talking about universal advantages of the human being."

In the endgame, chess programmers say, humanity is doomed.

"Man is in the middle of a revolution," says Monty Newborn, chairman of the Association for Computing Machinery Computer Chess Committee. "When man found out the world was round, his perspective of himself changed. When he found out he was like the rest of the animals, his perspective changed. In the end of the 20th century, man's mind, his last claim to uniqueness, is going down the drain."

"We're going through a period where one activity after another is going be transferred from the domain where humans are superior to the domain where computers are superior," concurs Larry Kaufman, co-creator of Socrates, one of the top-20 commercially available chess programs. "After 50 years, there's not going to be much left in the intellectual area that computers can't do better than people."

Regardless of its association with music and literature (the writer Vladimir Nabokov described the game as "poetico-mathematical"), chess, many argue, is just a mathematical problem.

There is a probabilistic path to each outcome, a path dependent, of course, on your opponent's next move, and your ability to peer 167 ►



DON'T PANIC!!

The Illustrated Hitchhiker's Guide to the Galaxy may be even stranger and more wonderful than you anticipated. This coffee-table version of Douglas Adams's geek staple is all slick production, betraying the Brit's own romance



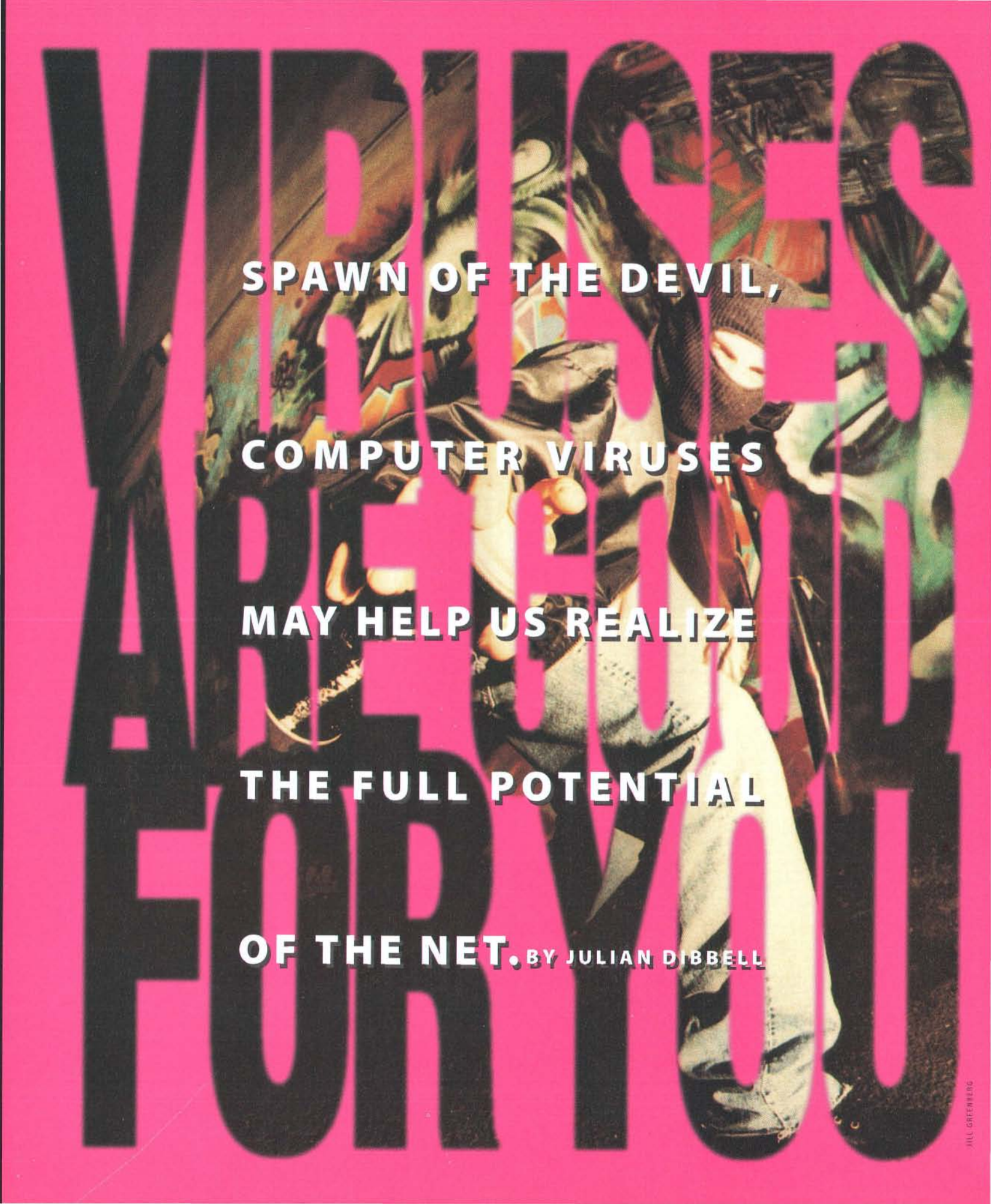
with desktop publishing.

The dazzling oversized holographic-foil dust cover opens onto a loud mix of photorealistic illustrations and '90s poly-font typography, and every illustration reads like a still from a full-length feature film. Indeed, the book's extensive credits include artists and model makers from the movies *Alien*, *Star Wars*, and *Who Framed Roger Rabbit* and the *Dr. Who* and *Hitchhiker's Guide* TV series. Each image carefully meshes photographed sets and computer graphics.

Above, chaos reigns on the bridge of the spaceship *Heart of Gold* after an emergency use of the Infinite Improbability Drive. Twenty-five images were painstakingly fitted together to create this scene, part of an elaborate gatefold in the heart of the book. – *Tricia McGillis*

Tricia McGillis (trixter44@aol.com) *is designer emeritus of* Wired.

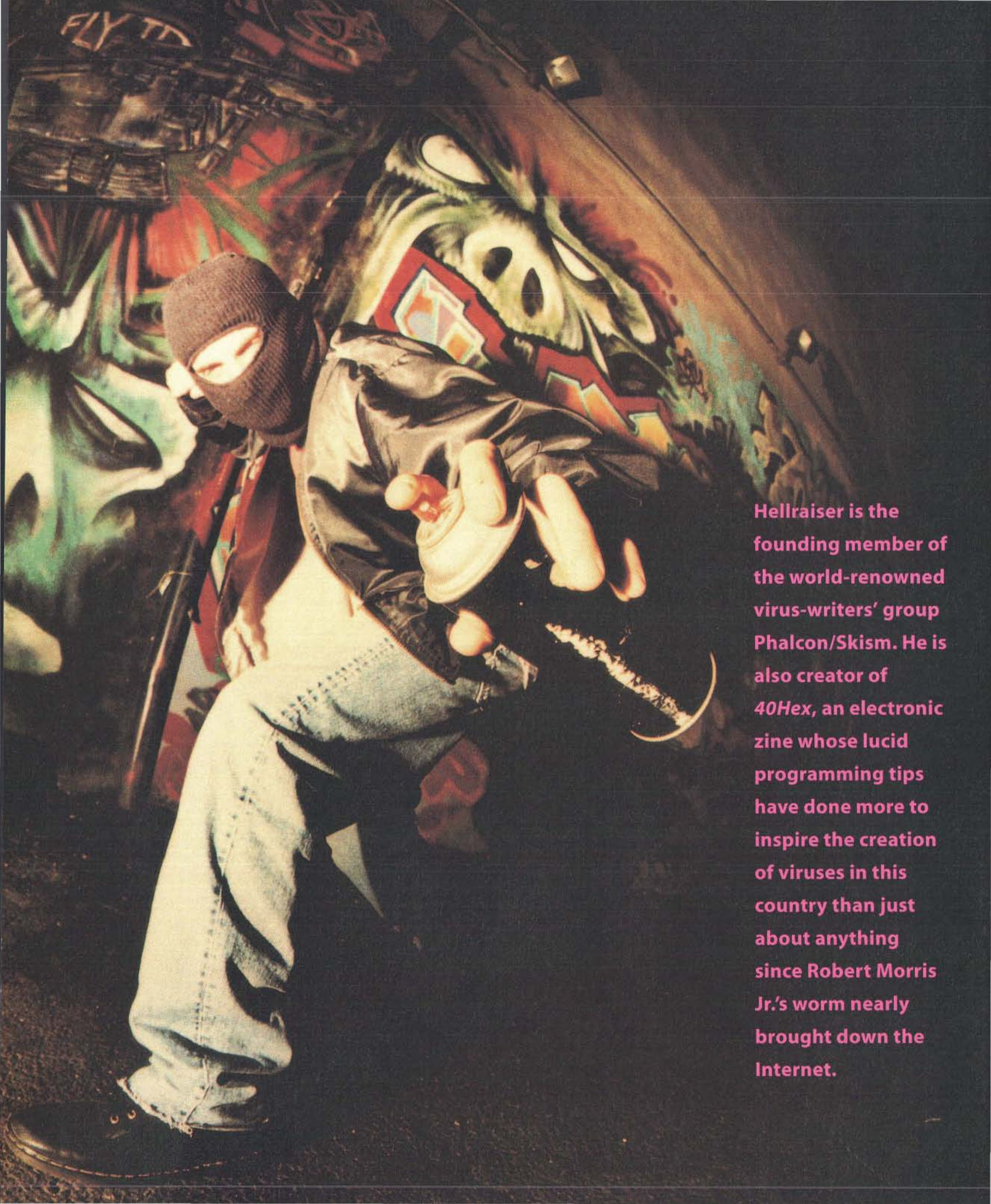
VIRUSES ARE GOOD FOR YOU



SPAWN OF THE DEVIL, COMPUTER VIRUSES MAY HELP US REALIZE THE FULL POTENTIAL OF THE NET.

BY JULIAN DIBBELL

JILL GREENBERG



Hellraiser is the founding member of the world-renowned virus-writers' group Phalcon/Skism. He is also creator of *40Hex*, an electronic zine whose lucid programming tips have done more to inspire the creation of viruses in this country than just about anything since Robert Morris Jr.'s worm nearly brought down the Internet.

What scares you most about getting that virus?

Is it the prospect of witnessing your system's gradual decay, one nagging symptom following another until one day the whole thing comes to a halt? Is it the self-recrimination, all the useless dwelling on how much easier things would have been if only you'd protected yourself, if only you'd been more careful about whom you associated with?

Or is it not, in fact, something deeper? Could it be that what scares you most about the virus is not any particular effect it might have, but simply its assertive, alien presence, its intrusive otherness? Inserting itself into a complicated choreography of subsystems all designed to serve your needs and carry out your will, the virus hews to its own agenda of survival and reproduction. Its oblivious self-interest violates the unity of purpose that defines your system as *yours*. The virus just isn't, well, you. Doesn't that scare you?

And does it really matter whether the virus in question is a biological or an electronic one? It should, of course. The analogy that gives computer viruses their name is apt enough to make comparing bioviruses and their digital analogs an interesting proposition, but it falls short in one key respect. Simply put, the only way to fully understand the phenomenon of autonomously reproducing computer programs is to take into account their one essential difference from organic life forms: they are products not of nature but of culture, brought forth not by the blind workings of a universe indifferent to our aims, but by the conscious effort of human beings like ourselves.

Why then, after a decade of coexistence with computer viruses, does our default response to them remain a mix of bafflement and dread? Can it be that we somehow refuse to recognize in them the traces of our fellow earthlings' shaping hands and minds? And if we could shake those hands and get acquainted with those minds, would their creations scare us any less?

These are not idle questions. Overcoming our fear of computer viruses may be the most important step we can take toward the future of information processing. Someday the Net will be the summation of the world's total computing resources. All computers will link up into a chaotic digital soup in which everything is connected – indirectly or directly – to everything else. This coming Net of distributed resources will be tremendously powerful, and tremendously hard to harness because of its decentralized nature. It will be an ecology of computing machines, and managing it will require an ecological approach.

Many of the most promising visions of how to coordinate the far-flung communication and computing cycles of this emerging platform converge on a controversial solution: the use of self-replicators that roam the Net. Free-ranging, self-replicating programs, autonomous Net agents, digital organisms – whatever they are called, there's an old fashion word for them: computer viruses.

Today three very different groups of heretics are creating computer viruses. They have almost nothing to do with each other. There are scientists interested in the abstract behaviors of self-replicating codes, there are developers interested in harnessing the power of self-replicating programs, and there are unnamed renegades of the virus-writing underground.

Although they share no common experience, all these heretics respect a computer virus for its irrepressible mobility, for the self-centered autonomy it wrests from a computer environment, and for the surprising agility with which it explores opportunities and possibilities. In short, virus enthusiasts relate to the virus as a fascinating and powerful life form, whether for the fertile creation of yet more powerful digital devices, as an entity for study in itself, or, in the case of one renegade coder, for reckless individual expression.

"Viruses are the electronic form of graffiti," says Hellraiser. "With viruses," he remembers thinking, "you could get your name around *the world*." He was right.

Getting a buzz from the Vx

One computer virus writer in his early 20s lives on unemployment checks in a white, working-class exurb of New York City. He tends to spend a fair amount of his leisure time at the local videogame arcade playing *Mortal Kombat II*, and would prefer that you didn't know his real name. But don't let the slacker résumé fool you: the only credential this expert needs is the pseudonym he goes by in the computer underground: Hellraiser.

Hellraiser is the founding member of the world-renowned virus-writers' group Phalcon/Skism. He is also creator of *40Hex*, an electronic zine whose lucid programming tips, hair-raising samples of ready-to-run viral code, and trash-talking scene reports have done more to inspire the creation of viruses in this country than just about anything since Robert Morris Jr.'s spectacularly malfunctional worm nearly brought down the Internet.

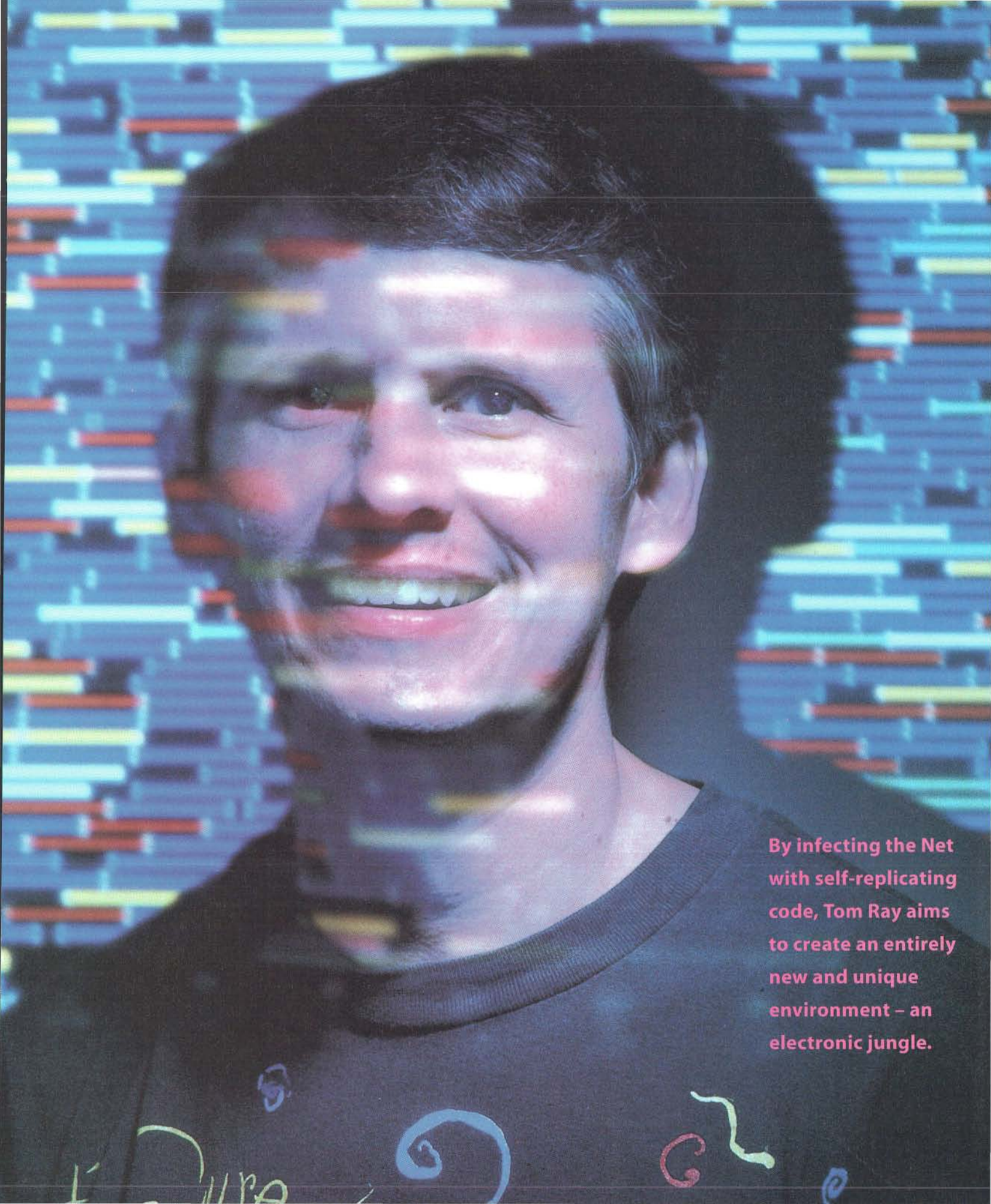
And as if all this weren't enough, Hellraiser also comes equipped with the one accessory no self-respecting expert in this cantankerous field can do without – his very own pet definition of computer viruses. Unlike most such definitions, Hellraiser's is neither very technical nor very polemical, and he doesn't go out of his way to make it known. "Sure," he'll say, with a casual shrug, as if tossing you the most obvious fact in the world: "Viruses are the electronic form of graffiti."

Which would probably seem obvious to you too, if you had Hellraiser's personal history. For once upon his teenage prime, Hellraiser was also a hands-on expert in the more traditional forms of graffiti perfected by New York City youth in the 1980s. Going by the handle of Skism, he roamed the city streets and train yards with a can of spray paint at the ready and a Bronx-bred crew of fellow "writers" at his side, searching out the sweet spots in the transit system that would give his tag maximum exposure – the subway cars that carried his identity over the rails, the truck trailers that hauled it up and down the avenues, and the overpasses that announced it to the flow of travelers circulating underneath.

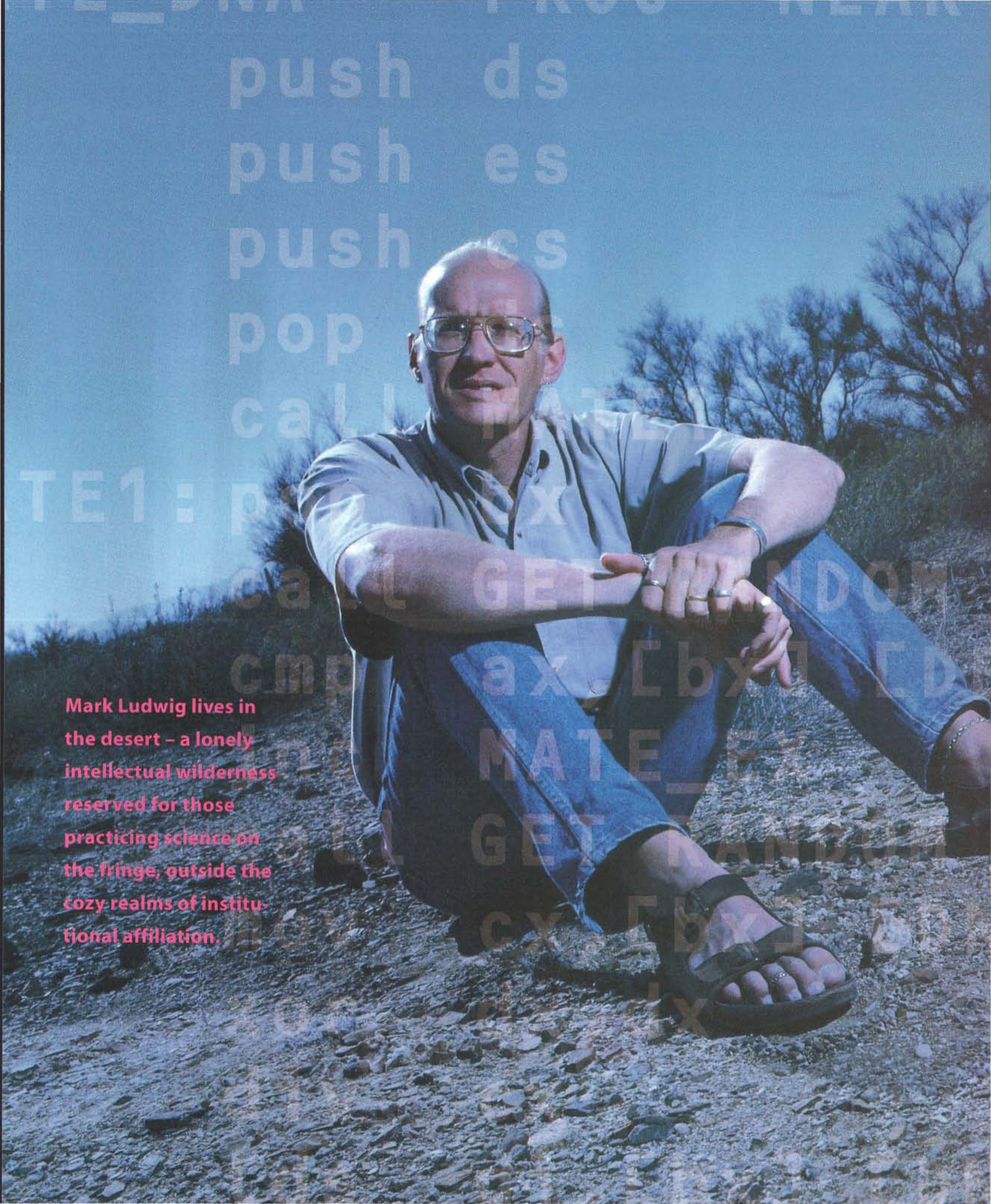
In other words, by the time Hellraiser went off to college and developed a serious interest in computers, he was already quite cozy with the notion of infiltrating other people's technology to spread a little of himself as far and wide as possible. So when he discovered one day that his PC had come down with a nasty little digital infection, his first thought was not, as is often customary, to curse the "deviant hackers," "sociopaths," and "assholes" who had written the program, but to marvel at the possibilities this new infiltration technique had

Julian Dibbell is a New York-based writer who contributes regularly to the Village Voice.

BILL ZEMANEK



By infecting the Net with self-replicating code, Tom Ray aims to create an entirely new and unique environment – an electronic jungle.



Mark Ludwig lives in the desert – a lonely intellectual wilderness reserved for those practicing science on the fringe, outside the cozy realms of institutional affiliation.

opened up. Street graffiti's ability to scatter tokens of one's identity across the landscape of an entire metropolis looked provincial in comparison. "With viruses," Hellraiser remembers thinking, "you could get your name around the *world*."

He was right. The program that had infected his own computer in late 1990, the so-called Jerusalem virus, had spread from Italy to Israel to North America before finally making its way into the pirated copy of the Norton Utilities that brought it to Hellraiser's hard drive. And though Jerusalem's author remained uncredited, other programmers from nearly every corner of the globe were pulling off feats of long-distance self-aggrandizement that dwarfed anything within the reach of America's spray-paint commandos. A kid who called himself Den Zuk had launched a virus that was flashing his handle on computer screens all over Europe, the US, and South America. Early speculation placed its origin in Venezuela, but the virus was eventually tracked to its true source in Bandung, Indonesia, when a researcher in Iceland guessed that some enigmatic characters in the source code were in fact a ham-radio call sign; they made contact with the call sign's registered operator, who immediately copped to his authorship of the program.

Equally far-ranging was the journey of the Joshi virus, which spread from India to parts of Africa and on to the rest of the world, popping up every January 5th to command computer users to type "Happy Birthday Joshi" if they wanted control of their systems back.

What impressed Hellraiser as much as the vast geographic distances covered by viruses, however, was their long range over time. After all, a painted graffiti tag would only last as long as it took to fade away or be painted over, but viruses, it seemed, might replicate forever in the wild. Indeed, the Jerusalem virus had been doing so for three years before Hellraiser encountered it, and four years later it remains one of the world's most commonly reported viruses. Likewise, Den Zuk is still reproducing on computers worldwide six years after it first left the island of Java; Joshi continues for the fifth year in a row to extort international birthday wishes. Dozens of other viruses from the US, Canada, Eastern Europe, Taiwan, Australia, Turkey, Malta, and other far-flung locales thrive globally (This despite that the antivirus industry spends tens of millions of dollars a year to eradicate them.) Bearing encoded bits of their authors' souls – clever jokes, crude graphics, friendly greetings, and, of course, occasionally, malicious intentions (though in fact the majority of viruses found in the wild are designed to do no damage) – viruses roam the earth in apparent perpetuity.

For Hellraiser, steeped as he was in graffiti culture's imperative to "get the name across," there was only one possible response to this new technology of self-projection: he had to get in on the action. But how? Virus writing wasn't exactly a standard subject in computer-science courses, and even the computer underground – with its loose-knit network of bulletin boards and e-zines proffering instruction in the illicit arts of hacking and phone phreaking – wasn't the most dependable source of virus lore. Occasionally, a hack and phreak board might offer a small collection of cryptic viral source code for brave souls to experiment with, but as far as Hellraiser knew, the only system exclusively devoted to viruses at the time was a place called the Virus Exchange, operating out of what was then the world's epicenter of virus production: post-Communist Bulgaria, where the Cold War's endgame had left a lot of overtrained programmers with time on their hands and anarchy on their minds.

Lacking the money or the phreaking skills to dial in to the Virus Exchange, Hellraiser made do with what he did have: a live specimen of the Jerusalem virus, replicating furiously inside his desktop system and poised to trash every program file he tried to run on any upcoming Friday the 13th. Carefully, Hellraiser extracted all copies of the virus from the computer and holed up in his dorm room to examine its workings. He studied it for weeks, and then finally, tentatively, he produced a virus of his own. It was a shameless hack really, essentially just the Jerusalem code with the tag line "SKISM-1" inserted in place of a few of the original characters. But after infecting as many computers as he could and subsequently finding his creation enshrined in antivirus literature as the "Skism-1" virus, Hellraiser swelled with a pride he would later recall with some amusement: "Shit, I thought I was the man back then."

Steeped as he was in graffiti culture, Hellraiser had to get in on the action. But how? Virus writing wasn't exactly a standard subject in computer-science courses.

Hooked on that buzz, he dove deeper into his studies, aiming for proficiency in DOS assembly language, the formidably austere low-level programming dialect in which Jerusalem was written (like the vast majority of computer viruses then and now). He quickly acquired the ability to produce viruses he could truly say were his, and along with this ability, he picked up the beginnings of a rep among New York-area denizens of the underground. Gradually, through the hack/phreak (h/p) bulletin-board scene, he made contact with other isolated virus writers – subculture orphans compared with the h/p crowd and its Legions of Doom, MODs, Chaos Clubs, and other constantly forming and re-forming groups and factions.

Hellraiser started wondering why he shouldn't put together a group of his own. Soon enough, the retired graffiti bomber was again running with a crew, formally known as Smart Kids Into Sick Methods (Skism for short) and dedicated to sharpening the virus-writing skills of both its members and the virophilic public at large.

And it was to serve more or less those lofty ends that Skism's electronic house journal *40Hex* was born. Named for the assembly-language function by which viruses copy themselves, the publication hit the boards of the Vx underground with an infectiousness all its own. (Vx, short for virus exchange, denotes all boards devoted, like their Bulgarian namesake, to virus discussion and traffic in viral source code.) Its unapologetic bad attitude was a brash wake-up call to the still-embryonic virus-writers' community. "This is a down and dirty zine [which] gives examples on writing viruses and ... contains code that can be compiled to viruses," wrote Hellraiser in the introductory file of *40Hex's* March 1991 première. "If you are an antivirus pussy, who is just scared that your hard disk will get erased so you have a psychological problem with viruses, erase these files. This aint for you."

The warning scared off no one, of course, least of all the alleged

BILL ZEMANEK

Everything You Always Wanted to Know about Viruses (But Were Afraid to Ask)

Little Black Book of Viruses **($14.95) and *Computer Viruses, Artificial Life, and Evolution* ($22.95) by Mark Ludwig are available from American Eagle Publications Inc., PO Box 41401, Tucson, AZ, 85717.**

Tom Ray can be found at *ray@hip.atr.co.jp*. A copy of his proposal for the networkwide biodiversity project can be found at *ftp://tierra.slhs.udel.edu/tierra/doc/reserves.tex*, and the source code for the Tierra program is *ftp://tierra.slhs.udel.edu/tierra/tierra.tar.z*.

For executable DOS code on disk send a check for $US50 (payable to "Virtual Life") to: Virtual Life, 25631 Jorgensen Road, Newman, CA, 95360.

Fred Cohen's book *It's Alive! The New Breed of Living Computer Programs* (Wiley & Sons, $39.95) is a nice introduction to the question of viruses as a-life. The book includes a disk of reproducing Macintosh programs.

To find out more on *40 Hex*, e-mail *fortyhex@phantom.com*.

– Julian Dibbell

pussies of the antivirus industry, who took to scouring every new issue for a peek inside the mind of the enemy, getting up close and personal at last with the phantoms they'd been battling for years. Not that the life of the virus hunter was a lonely one. In fact, the antivirus community was already in many ways a more advanced subculture than that of the virus writers, complete with local color and a mystique all its own: the industry pioneer and media darling John MacAffee was famed for his giddy morning-after overestimation by a factor of 10 of the Internet worm's damage; then there were those Bulgarians, the notorious and proud Dark Avenger – who signed, and even dedicated, his viruses – and his driven nemesis, Vesselin Bontchev. Endlessly revising and debating the burgeoning taxonomy of virus species, nervously policing the boundary between the great unwashed and those trustworthy enough to handle "live" specimens, the world of antivirus research offered its initiates a thrill somewhere between the delightful romance of butterfly collecting and the grim camaraderie of working for the National Security Agency.

In comparison, virus writing – while obviously not without its kicks – lacked community. But in the months and years following *40Hex's* début, that began to change. The previously inchoate and virtually invisible virus-writing underground at last coalesced and shifted into high gear. Various groups proliferated and crossbred: Skism merged with another New York posse called Phalcon to form the Phalcon/Skism supergroup, while the pan-European TridenT team and the Canadian-Australian-Swiss-Taiwanese-multinational NuKE crew quickly rose to challenge Phalcon/Skism's prestige and programming skills. Zines multiplied, too: NuKE's *Info Journal* and West Coast virus writer Urnst Kouch's *Crypt Newsletter* challenged *40Hex's* hegemony, as did the number of so-called Vx bulletin boards that rocketed from a handful worldwide to rough estimates of as many as 200 at present.

Amid all the rapid growth it helped set in motion, *40Hex* has kept pace. After the first four raucous issues, Hellraiser handed over the editorial reigns to Phalcon's designated archivist, Garbage Heap, who has steadily increased the circulation of the zine while slowly steering it toward something suspiciously like respectability. Available now in a crisp, desktop-published paper edition as well as good old-fashioned e-text, today's *40Hex* still brims with the gnarliest of viral code and remains a feisty defender of the right to create and publish viruses. But it frowns on anyone who looses viruses into the wild and is more likely to solicit guest editorials from antivirus types than to hurl obscenities at them.

The young hellion who founded the zine would probably not approve – that is, if the same young hellion were still around to say anything about it. But he isn't. Not really. Hellraiser has undergone some changes of his own lately. Once quite cavalier about releasing viruses that intentionally deleted files or otherwise "fucked people's shit up" (after all, what better way to make your tag linger on in their memory?), he eventually decided that creating destructive programs just gave virus writing a bad name and resolved thenceforth to produce viruses with more or less benign payloads only. And then one day, not too long ago and without much fanfare, he simply called it quits. Partly, he was starting to chafe at the limited range of programming challenges involved in virus creation, he says, but more to the point, his evolving young world view had somehow gotten infected by a creeping respect for the right of others to control what goes into their own digital back yards. Destructive payload or no destructive payload, Hellraiser reached the conclusion that it was just plain "wrong to 'pollute' other people's systems with viral garbage."

Which isn't to say he's gone over to the ranks of his old antivirus nemeses. Hardly. He's still too tight with all his Phalcon/Skism homeboys for that. Even if he weren't, he's been a virus writer for too long to feel comfortable with the easy demonizations that are the stock in trade of antivirus rhetoric. For the rest of us, of course, it's easy enough to accept the standard caricature of the underground virus writer as a low-grade sociopath. After all, what else but antisocial perversity could lead someone to produce a mechanism we encounter principally as contamination in the digital environment, as noise on the line?

Yet Hellraiser's career path – from graffiti writing to virus writing and beyond – demands a more complicated understanding of the virus phenomenon. It asks us to recognize that viruses, like graffiti, are just as much signal as noise – that they are in fact an irreducible confusion of the two. As Hellraiser came to recognize, the noisiness of viruses is built in – they are by definition information that subverts control. But as the subculture Hellraiser helped build will always remember, every virus turned out into the computer wilds – like every tag sprayed onto the hard urban landscape – is also a carrier for the purest and strongest signal a human being can send. "Remember my name," the virus says, which – after all – is another way of saying: "I'm alive."

This is about as far as most discussions of virus writing get: ignorant kids thrashing about in codes, creating horribly simple but efficient digital bombs. And even if you take a very generous view that the underground virus writers are inadvertently creating new forms of life, the discussion of beneficial viruses would have to stop here if it weren't for folks like Dr. Mark A. Ludwig.

The mutator in the desert

Mark Ludwig lives in a desert, and compared to Hellraiser's back-

ground, seems to hail from an entirely different planet. But Ludwig, too, is chasing the elusive nature of computer viruses.

A married man with three young children, Ludwig lives in Tucson, Arizona, where barrens of sand and sun and saguaro cactus shimmer not too far beyond the sump-cooled confines of his home. But the desert where he wanders is someplace else entirely: it's the lonely intellectual wilderness reserved for those who practice science on the fringe, outside the cozy realms of institutional affiliation, professional consensus, or methodological decorum.

He doesn't have to be there. With his PhD in physics from the University of Arizona (and his prior course work at Cal Tech and MIT), Ludwig could easily return to the fold of respectable researchers if he chose. All he'd have to do is let go of his somewhat obsessive scholarly pursuit of the wild computer virus, and pick a slightly more conventional object of study. Or maybe just pursue his present subject with a little more sober attention to devising antivirus countermeasures and a lot less gleeful fascination with viruses in and of themselves. Or maybe just tone down the florid libertarian rhetoric and sweeping philosophical claims in which he tends to couch his otherwise gruellingly meticulous analyses of viral performance and technique.

Really, it wouldn't take much.

But Ludwig isn't likely to do any of these things, because he actually seems to prefer the hardships of the fringe to the rewards of a life on the techno-scientific inside.

He didn't always. "Once I was a scientist of scientists," writes Ludwig in the introduction to his latest self-published treatise, *Computer Viruses, Artificial Life, and Evolution*. "Born in the age of Sputnik, and raised in the home of a chemist, I was enthralled with science as a child. If I wasn't dissolving pennies in acid, I was winding an electromagnet, or playing with a power transistor, or doing a cryogenics experiment – like freezing ants – with liquid propane." Eager to work his way into the company of "the great men of science" and join their noble quest for objective Truth (he'd read about it in textbooks), Ludwig rushed through his undergraduate work at MIT in two years, then plunged into his graduate course of studies with equal enthusiasm. By the time he got his doctorate, however, he'd seen enough of the political infighting and blind prejudice that structure the real work of contemporary scientific investigation to sour the romance permanently. Disillusioned, he dropped out of the hard-sci grind and into a job working with computers, a field that at least provided some of the wide-open pioneering spirit that the textbook histories of science had promised, even if it moved him further from pure science's intimacy with the mysteries of nature.

But not long after that, around 1988, he started picking up reports of contagious programs running loose among the machines he now made his living from, and the course of his life changed yet again. For Ludwig, viruses came bearing the same mind-expanding message-in-a-bottle they would not much later be bringing to Hellraiser. Except that Ludwig decoded the message a little differently. Where Hellraiser heard the signal "I'm alive" coming from the virus's creator, Ludwig understood the message as coming directly from the virus itself. Viruses *behaved* like living things: self-reproducing and autonomous. Might we not understand life a little better, he wondered, if we can create something similar, and study it, and try to understand it? The mysteries of nature, in other words, now loomed closer than ever – right there on the wide-open technological frontier to which he'd fled from the wreckage of his scientific aspirations – and Ludwig couldn't resist the temptation to go questing after them once more.

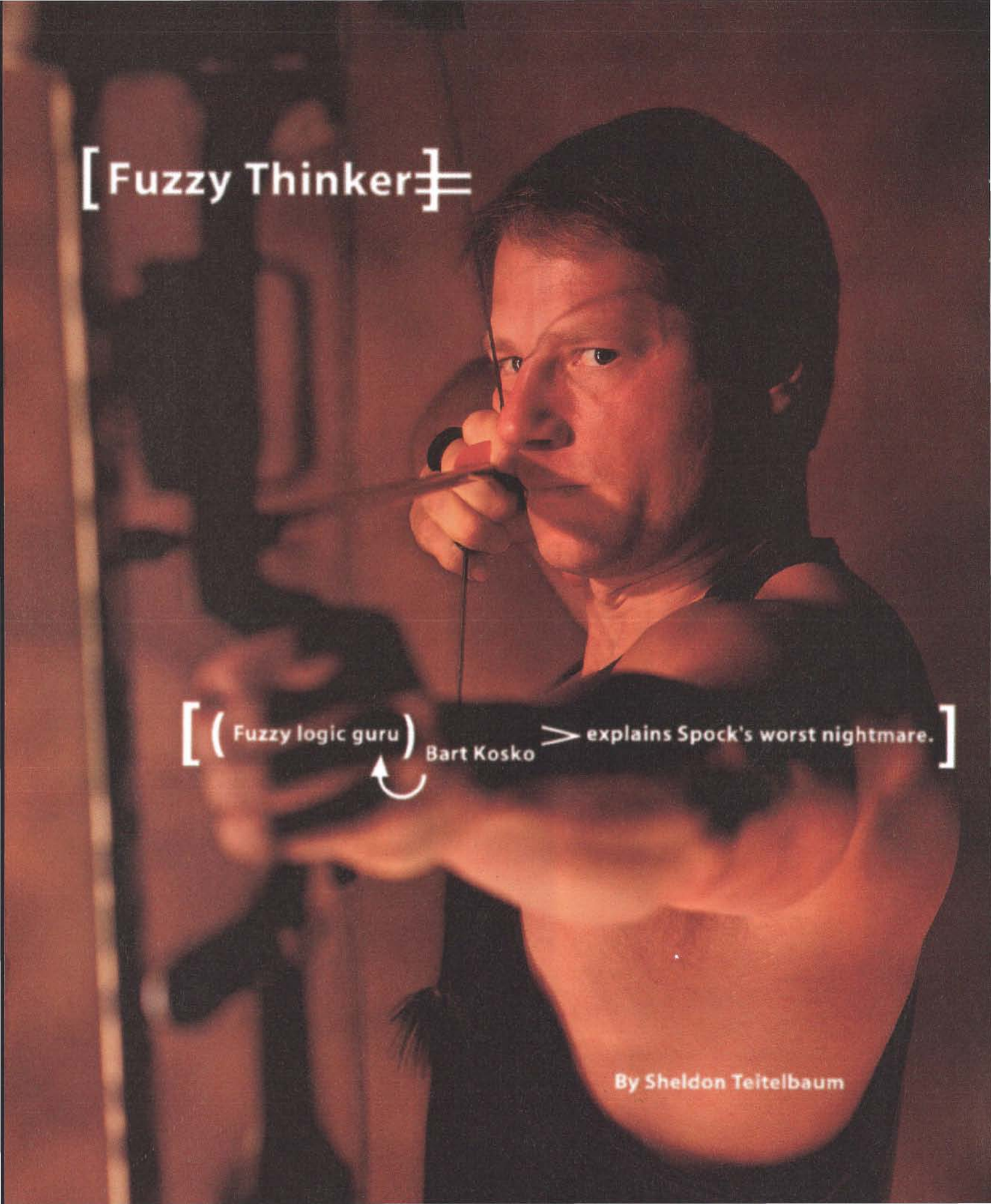
His initial attempts to acquire specimens to observe were frustrating. Today's teeming ecology of one-stop Vx trading posts didn't exist. When Ludwig approached the antivirus community for access to its shared research collections, he found himself shut out: then as now, the A-V crowd refused to release captured virus code to anyone outside a trusted inner circle. So, true to his style, Ludwig decided to go it alone. He set up a BBS, announced a bounty of US$25 for every virus uploaded, and sat back while the code rolled in. After building up a representative cross section of the wild virus population, he set about examining his haul, and within a few months his research bore its first fruit: *The Little Black Book of Viruses*, a technical primer on the essentials of virus writing, complete with scrupulously annotated source code for four virus programs of his own creation.

"People think of viruses as an invasion from Mars," Ludwig says. "And that hurts research into these things. My aim is to change people's attitudes, to cut down fear."

The Little Black Book made something of a name for Ludwig, but it wasn't an especially pretty one. Though the tutorial viruses were pointedly nondestructive and came surrounded by warnings against their misuse and instructions on how to keep them from getting loose, the book was roundly condemned as an incitement to digital vandalism. In the three years of steady sales since *The Little Black Book's* original publication in 1991, various mainstream computer magazines have summarily dropped Ludwig's advertisements for the book as inappropriate subject matter for their audiences. And when the book was recently released in France (as *Naissance d'un Virus*, or "Birth of a Virus"), its publishers there were immediately slapped with a legal injunction against distributing it with the infectious source code intact.

But Ludwig has remained undaunted in the face of the world's virophobia. If anything, its vehemence has only sharpened his determination to share the wealth of his knowledge. "People think of viruses as an invasion from Mars," he says, "and that hurts research into these things. My aim is to change people's attitudes, to cut down some of the fear."

To that end he has established an annual international virus-writing competition, flying cheerfully in the face of the "swarming hordes of antivirus developers." (One year's contest rewarded the smallest functional DOS virus submitted.) Ludwig also publishes a newsletter now, *Computer Virus Developments Quarterly*, in which he mingles detailed technical discussion of viral code with rants against the tyrannical tendencies of American government, the moral bankruptcy of contemporary Western culture, and (last but not least) the evils of repressing detailed technical discussion of viral code. Occasionally he even gets a sign that the general public is starting to come around to his pro-knowledge agenda: after five months of wrangling its way 172 ►



[Fuzzy Thinker]

[(Fuzzy logic guru) Bart Kosko > explains Spock's worst nightmare.]

By Sheldon Teitelbaum

Wired: What is fuzzy logic and why do critics call it "the cocaine of science?"

Kosko: Fuzzy logic is Spock's worst nightmare – a way of doing science without math. It's a new branch of machine intelligence that tries to make computers think the way people think and not the other way around. You don't write equations for how to wash clothes. Instead you load a chip with vague rules like "if the wash water is dirty, add more soap," and "if very dirty, add a lot more." All wash water is dirty and not dirty – to some degree. It's just common sense. But it breaks the old either/or logic of Aristotle. That offends some scientists, who would like us to think and talk like off/on switches. But they still haven't produced a statement of fact like "the sky is blue" or "$E=mc^2$" that is 100 percent true or 100 percent false. Fact ain't math. You can never get the science right to more than a few decimal places. That's one reason we find chaos when we look at things up close.

The Japanese and Koreans produce billions of dollars each year in fuzzy washing machines, microwave ovens, and carburetors. Is fuzzy logic just another gadget technology?

No. Fuzzy systems are universal computers. I proved that as a theorem – the fuzzy approximation theorem. In theory, you can replace every book on physics or economics with equivalent books that have fuzzy systems where the equations used to be. Fuzzy systems are "model-free" estimators. You don't have to guess at equations to build a bridge from inputs to outputs. Fuzzy rules build that bridge for you. There is math behind the rules, but you don't need to know it to program a fuzzy system. You can program it in English. "If the air is cool, turn the AC down a little." But the math is not fuzzy. That's why you can capture fuzzy logic in a digital chip.

Most of the first fuzzy systems were in control – as in adjusting a camera lens or backing up a trailer truck to a loading dock. Now we're applying fuzzy systems to wireless communications and multimedia. The fuzzy rules can "randomly" spread signals over a wide bandwidth or teach an intelligent agent the kind of houses or sunsets you prefer. The math says we can apply them anywhere. In practice, it may not be so easy.

How can a fuzzy system screw up?

The rules. The first problem is, where do you get them? Dumb rules give dumb systems. The bigger problem is rule explosion. You want to add more variables to capture more causes and to make the system more realistic. You might add humidity and light intensity to temperature in the air conditioner. The catch is that the number of rules grows exponentially as you add new variables. So you try to find optimal rules. The math tells us they cover the turning points of the system – they patch the bumps.

Where do neural networks come in?

At the front end. They tune the fuzzy rules by tuning the fuzzy concepts or sets. I may draw cool air as a triangle centered at 65 degrees Fahrenheit. The air is 100 percent cool at 65 but only 80 percent cool at 63 or 67. You may draw a fatter or a thinner triangle. Or you may center it at 70. This reminds us that we don't all mean the same thing for even the most basic sensory terms. And that's OK. You get user friendliness by finding your own niche in the conceptual anarchy.

You once consulted on the Tomahawk cruise missile. What joys will fuzziness deliver in the way of ballistic buggery?

The Smart War – all of our smart weapons against all of theirs. Right now, you have to store 50,000 to 100,000 images of a tank in a cruise missile's chip brain for a neural net to match against. Then it can tell a tank from a tree at all angles and resolutions. As chips continue to shrink, you can store more and more of these fuzzy patterns and allow the missile to reason with more and more fuzzy rules.

You are a well-published libertarian. Is there a political tie to fuzz?

For me there are two. First, I am pro-choice on all issues. Tyranny is one choice. Binary is next with two choices. Fuzz gives a whole spectrum of choices – and thus freedom of response. The pro-life zealot who wants to draw a hard line between life and death at conception or the first trimester is a binary tyrant of sorts. There is no hard line between life and death. It's a curve, or fuzzy set.

Second, I think someday we will see what I call a fuzzy tax form. As it works today, all your tax dollars go to general revenues. But suppose only half did, and the other half goes to social categories of your choice. Maybe 30 percent for AIDS research, 40 percent for debt relief, and 30 percent for environmental cleanup. That way you could set up real research bounties. Our binary tax forms deny us such a choice.

Taxes and death. You oppose them both.

Yes. It's a hell of a thing to live in a machine that has no backup. I am one of 500 or so who has a cryonic bracelet and hopes to see if future nanotech can rebuild those cells and synapses. That, too, is a form of backup. The better thing is just to upload in a chip. The brain stores about a billion billion bits of information and runs at about 10 million billion bits per second. Today you would need a chip the size of a house. But if Moore's Law keeps doubling the circuit density of chips every two years or so, by around 2020, your brain should fit to the last bit on a chip the size of a sugar cube. You could last until your last chip fell into a black hole or star.

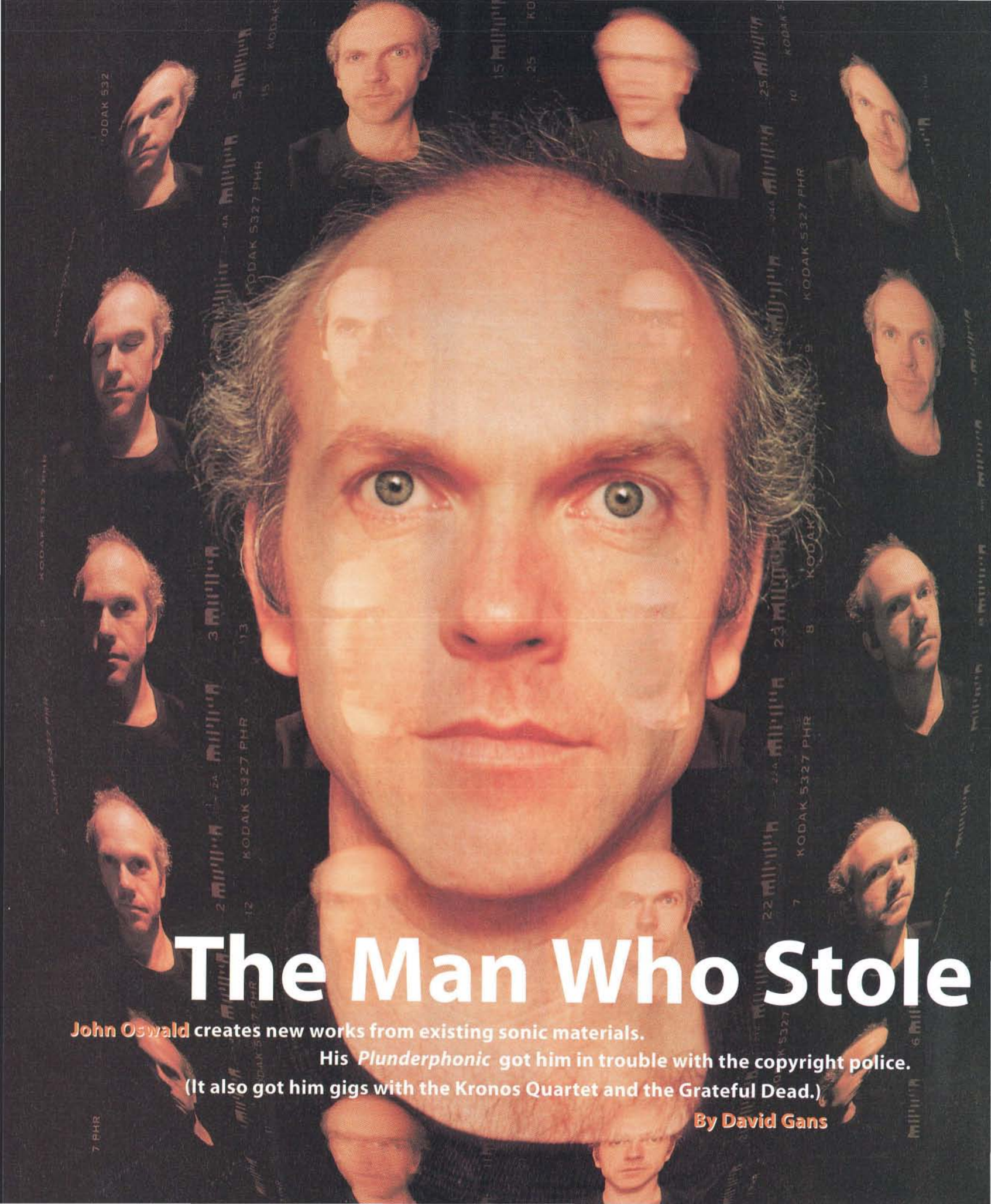
On chip time, that may be as close to eternity as we can come in a universe made of matter and energy. Heaven or hell in a chip. Until then, it's burn, bury, or freeze. I wouldn't bet my life on cryonics, but I am happy to bet my death on it.

Bart Kosko holds degrees in philosophy, economics, math, and engineering. He chaired the first international conference on neural networks when he was 27. At 34, he is a tenured professor in electrical engineering at the University of Southern California. Kosko came to USC from the farmlands of Kansas on a full music scholarship – he wrote his first symphony when he was 18. Now he directs the prestigious Signal and Image Processing Institute, where he works on HDTV, brain scanning, and future effects for "digital film."

Kosko has written three textbooks and the best-selling *Fuzzy Thinking*. Today, you can find him pumping iron, scuba diving against the downward currents off the coast of Cozumel, or, armed with a bow-and-arrow, hunting wild boar. He recently shared a cigar with Sheldon Teitelbaum, filling a room with fuzzy ruminations.

Sheldon (Sheli) Teitelbaum is a Los Angeles-based senior writer for the Jerusalem Report *and a contributor to* Sci Fi Universe *and the* Los Angeles Times.

HENRY BLACKHAM



The Man Who Stole

John Oswald creates new works from existing sonic materials. His *Plunderphonic* got him in trouble with the copyright police. (It also got him gigs with the Kronos Quartet and the Grateful Dead.)

By David Gans

Michael Jackson's Face

On John Oswald's *Plunderphonic* CD, Dolly Parton's voice slows to that of an operatic tenor – aural sex change, the artist calls it. The bombast of Beethoven's Seventh blares like a bronco in the chute, Count Basie's "Corner Pocket" twists in a kaleidoscope of sound, fragments of James Brown's voice slip from Public Enemy recordings. And in the *pièce de résistance*, Michael Jackson squeaks out a version of "Bad" like a kid on nitrous.

I played the Canadian composer's work recently at a dinner party I threw for some friends, and eventually someone asked the crucial question: "Did he have permission to do this?"

Why should John Oswald have to get permission? Both the vinyl EP and the CD are clearly marked "Not For Sale." His work is the sketchbook of an inspired audio artist, a calling card intended to raise Oswald's profile by bringing the listener inside his head for a taste and showing off his mastery of offline editing.

But Michael Jackson, CBS Records, and the Canadian Recording Industry Association said his work is illegal, and Oswald found himself hiring an attorney, agreeing to a settlement, and giving up copies of his work.

John Oswald's instrument is technology – analog and digital editing. His "revised performances," created from existing works, often make wry commentaries on the content of the source material. He makes some interesting points about how we hear and listen to music. Oswald calls the genre that creates new works from existing sonic materials *plunderphonics*. The moniker comes from a paper he gave to the Wired Society Electro-Acoustic Conference in Toronto in 1985, titled "Plunderphonics, or audio piracy as a compositional prerogative."

Oswald scrupulously credits the creators of all the material used in his plunderphonic releases. He is not trying to slip anything past his listeners, nor is he hoping to profit from the inspiration of others. But in this day of digital samplers and tape



recorders, "plagiarism" as a moral or legal concept is almost beside the point. A powerful idea is not going to crawl back down his brain stem just because of a chance encounter with some traditions about "intellectual property."

Oswald lists the sources of his work. Unfortunately, Oswald says, in aural media "there is no convention for putting quotation marks around something." By freely appropriating sound from the vast sea of information that surrounds us, and by taking pains to acknowledge that he is doing so, John Oswald is making explicit what is often ignored or obscured in the highly derivative world of mass-marketed culture.

The music industry traffics heavily in familiarity but values what it considers uniqueness: it's the nature of the game, if you're a recording artist, to come up with something that sounds enough like everything else to get the attention of a record company or radio programmer but is just different enough to be copyrighted.

It's perfectly OK, commercially speaking, to copy the guitar tone of a revered rock star or employ without alteration the factory-preset sounds in your electronic keyboard, or to raid wholesale the gestures and tonalities of a much-loved genre from the past. Everything old gets to be new again and again, as the Stray Cats, Harry Connick Jr., and any number of kids with granny glasses and Rickenbackers have demonstrated over and over and over.

But if your music too closely follows a sequence of notes, you can get into a heap of trouble. Fantasy Records once attempted to sue John Fogerty for plagiarizing himself – it claimed a song he recorded for Warner Bros. was a rip-off of a song he recorded with Creedence Clearwater for Fantasy. Heavyweight George Harrison couldn't summon enough legal horsepower to fend off the owners of The Chiffons, who beat up the Beatle in court for plagiarizing "He's So Fine" in his song "My Sweet Lord" a few years later.

The damnedest things are coming up for legal disposition these days. Astronomer Carl Sagan took issue with Apple Computer's use of his name as the code word for a project in development – and when they changed the name of the project to "butthead astronomer," he sent the lawyers around again, apparently seeking to defend his dignity. Onetime counterculture ironist par excellence Bob Dylan took offense when Apple used "Dylan" – again as an internal

VID INGELEVICS

project designation, not even a commercial product. (Apple contends that the name derives from the phrase "dynamic language.")

Plunderphonics challenges how we listen to music. The inner sleeve of the EP features a long essay by British journalist David Toop, expounding on the pervasiveness and randomness of sound. Toop notes the lack (until very recently) of fossilized sound for study by audio archaeologists ("It is unlikely that the buzz of a mosquito will ever be found transfixed in perfection like a buried Chinese horseman") and asks some of the questions about ownership of sound that John Oswald has brought to the foreground.

When you buy music, Toop writes, you get "the privilege of ignoring the artist's intentions. You can take two copies of the same record, run through them with an electric drill, warp them on the stove, fill the grooves with fine sand and play them off-center and out of phase half-speed on twin turntables through a Fender Vibro Champ amplifier with the vibrato on maximum and the volume on 11."

"I started off as a listener," says Oswald, "but like most kids, I had a short attention span. I couldn't comprehend the structural pretenses of classical music: in the sonata form, the exposition and development would stretch on for several minutes, and by the time the recapitulation arrived, I would have capitulated."

Over time, Oswald made himself into an "active" listener. "I'd play 33-1/3 rpm LPs of classical music at 78 rpm, and – lo and behold – the structure would come into focus in an aural version of an overview." Listening to Stravinsky's "Rite of Spring" at 78 rpm "gave it the edge I imagined it must have had to upset people in 1913." (Stravinsky's Paris première caused riots, which may have had more to do with the dance than the music.) "I'd listen to be-bop slow," Oswald says. "Charlie Parker would sound like a beluga whale, but I could begin to hear how he put a solo together. That's something a lot of jazz musicians have done. And quite often I found that I preferred listening to some pieces of music at speeds other than the ones they were intended to be played at.

"I'd listen to be-bop slow," Oswald says. "Charlie Parker would sound like a beluga whale, but I could begin to hear how he put a solo together. And quite often I found that I preferred listening to some pieces of music at speeds other than the ones they were intended to be played at."

"I was doing a kind of manipulative listening in fairly complex ways, and as my interactive listening habits grew more complex, I began to think of ways to preserve them for other people to hear."

Digital audio has opened up a world of possibilities for both musicians and attorneys. Samplers and digital-editing systems have given rise to new genres of derivative works. Composer Carl Stone, who creates exquisite music with computers and appropriated sounds, says, "We must distinguish between musical laziness and transforming a musical object using your own creativity. But there's absolutely no way you can put that into a statute."

Since the '80s, "sampling" has referred to taking small portions of existing recordings as building blocks for new works. The practice is controversial, both artistically and legally, and some have tried to devise a system for licensing samples so the originating artists can be paid for materials.

But what John Oswald does is not "sampling." Rather than incorporate fragments of other people's recordings in his compositions, Oswald usually works with a complete piece of source music.

Oswald has used a variety of tools and techniques, from archaic to futuristic: he varies the speed of a turntable; slices up analog tape; builds an "imaginary orchestra" in which each virtual musician plays only one note *(klangfarbenprobe)*; builds a jazz quartet from four separate and unrelated solo performances; presents ambiguous information to a computer; loads fragments of the Beatles' "Birthday" into a sampling keyboard; instructs live musicians to play along with an Elvis Presley record, instructs other musicians to play along with those tracks, then wild-tracks the once-removed tracks on top of an edited version of the Presley cut without the intermediary material. And so on.

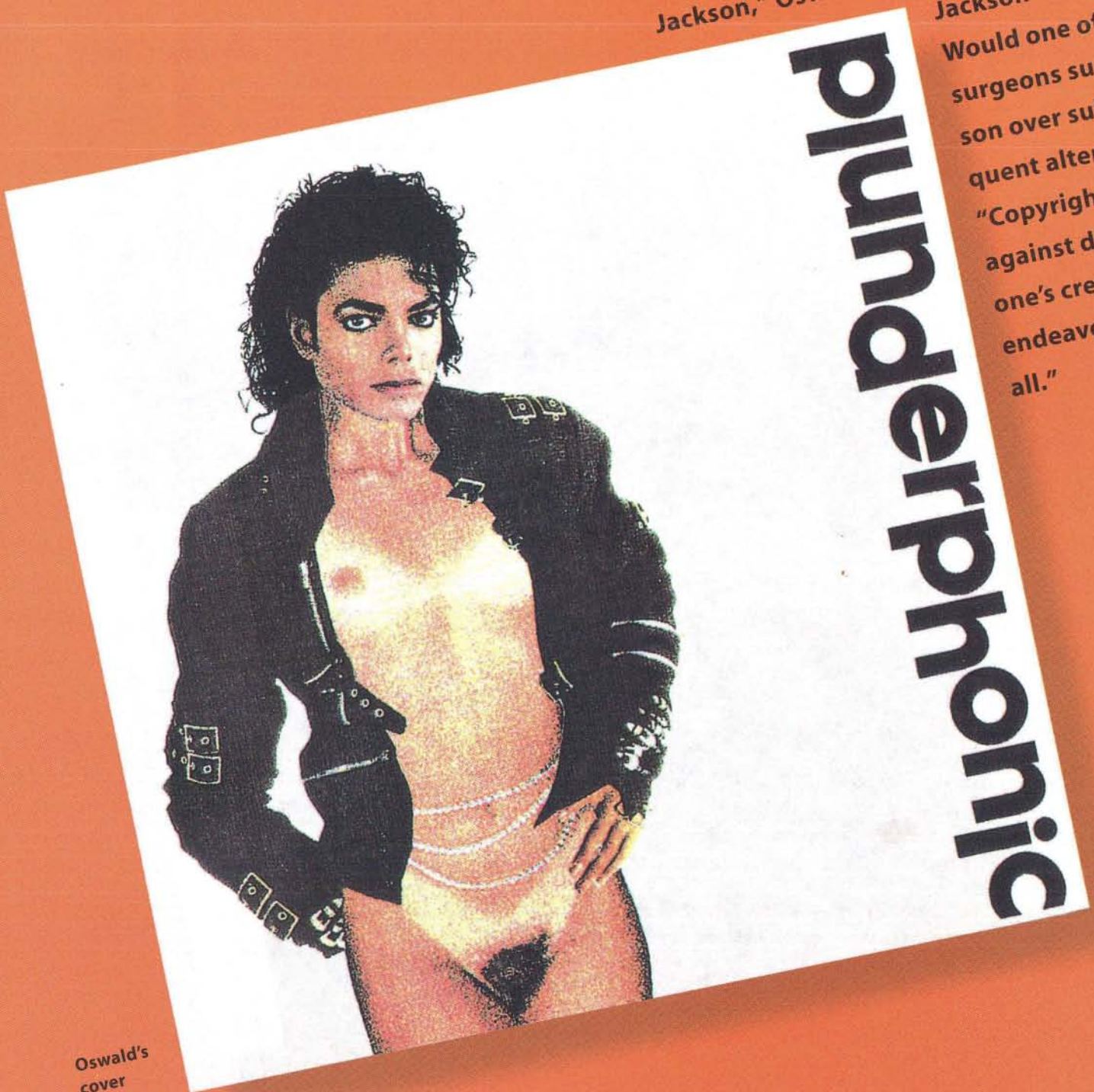
In 1989, Oswald collected his experiments and pressed a thousand copies of the *Plunderphonic* CD, which he distributed free of charge to radio stations, libraries, musicians, and critics. *Plunderphonic* asked the musical question, How can we be sure the "original" artist, whose wishes are sacrosanct, did not derive anything from any other source? Oswald's stunning cover montage for *Plunderphonic* grafted Michael Jackson's head and leather jacket onto an otherwise naked, Caucasian, shapely, young, female body.

According to Oswald's reading of US and Canadian copyright law, and some lawyers' interpretations, Oswald had thought that by not selling *Plunderphonic* he was legally in the clear. "I was fairly confident that what I was doing was not breaking the law, but I got a threatening letter from some record-industry lawyers saying that they consid-

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David Gans (tnf@well.com) *is an author, radio producer, and the president of Truth and Fun Inc.*

Noting the "artistic alterations plastic surgeons have performed on Micheal Jackson," Oswald asks, "Who owns Michael Jackson's face?" Would one of those surgeons sue Jackson over subsequent alterations? "Copyright protects against defacing one's creative endeavors, after all."



Oswald's cover montage for *Plunderphonic* grafted Michael Jackson's head and leather jacket onto an otherwise naked, young, female body.

ered what I was doing illegal," Oswald recalls.

Oswald found irony in Michael Jackson's action against him: Jackson has done his share of appropriating. Oswald says Jackson included, without attribution, more than a minute of the Cleveland Orchestra's 1961 recording of Beethoven's Ninth Symphony in the song "Will You Be There" on his *Dangerous* album.

"The credits to this song list Michael Jackson as the composer, the writer, and the rhythm and vocal arranger, but the track begins with a large segment of the Cleveland Orchestra recording, unaltered," Oswald complains. "It's even fairly hissy. There is nothing added to it until after it's finished, and Michael's song begins. Beethoven and his lyricist, Schiller, aren't mentioned. It's probably the longest example of directly sampled musical theft and plagiarism in pop music. Can anyone trust that 'Will You be There' really is Michael's song?"

Noting the "artistic alterations plastic surgeons have performed on the singer," Oswald asks, "Who owns Michael Jackson's face?" Would one of those surgeons sue Jackson over subsequent alterations? "Copyright protects against defacing one's creative endeavors, after all."

Notwithstanding his arguments, Oswald eventually engaged an attorney and agreed to a settlement: "I would give all the CDs I had remaining in my possession, and the master tapes for those CDs, to the association. They would destroy them in some way – which turned out to be crushing them – and I wouldn't make any more and I wouldn't distribute any more." These were analog attorneys, apparently: no one on the complainant side of the equation seems to know that, for all practical purposes, every copy still in circulation is an exact copy of the "master tape."

Oswald was not required to retrieve the 700 copies of *Plunderphonic* that he had already distributed, and so this masterpiece is still readily available in the cassette underground – and every one of those CDs is capable of spawning hundreds more. People are hearing *Plunderphonic* and learning its lessons.

The subversive CD was a roaring success. Not only did it force important legal and moral issues into the public discourse, but it made Oswald's reputation. Elektra Records hired him to work his twisted magic on a few of the company's greatest records, as an adjunct to the label's 40th anniversary collection, *Rubiyat*, which featured covers of classic Elektra cuts by current Elektra acts – another form of plunder, albeit contractually permissible in most cases.

Oswald assembled five pieces, and the label pressed a stack of promo-only CDs. "O'Hell," the leadoff track, is a screamingly funny revision of The Doors' "Hello I Love You," with a bit of the Cure's cover of that song and some flourishes, gestures, and punctuation from some other Doors tracks – a loving caricature. But Elektra decided not to distribute the plunderphonic *Rubiyat*; apparently not all of the plundered artists, or their heirs and assigns, were clear enough on the concept or happy enough with the results.

The Kronos Quartet commissioned Oswald to create a piece for its 1993 album *Short Stories*. Oswald spent a day in the studio with the musicians, collecting a vocabulary of expressions. "I got Kronos to do very simple things – play open strings, glisses, transitions between notes, certain shapes over a period of time. We recorded for about 10 hours, with the whole group and individuals. Some things they played together, some solo."

Oswald took these samples home to Toronto and threw them into a digital editing system. The result, "Spectre," begins with a single cello; over its nearly six-minute course, instruments are added until at its peak there are 4,000 – all Kronos. Then it thins out again, tapering down to one last pluck of the cello.

Fellow Kronos composer (and producer) John Zorn commissioned Oswald to create *Plexure* for his Avant label, available in the US only as a Japanese import. It's a 20-minute riot of pounding pointillism that delivers up tiny but recognizable pieces of thousands of pop records.

"I took a different tack from the first two plunderphonics projects, which focused on one performer at a time," Oswald explains. "I decided that I was going to try to include everybody from pop music on one disc – which is an insane attempt, but I managed to collect about 5,000 different pieces from about a thousand performing groups or individuals." Oswald did not credit his multitude of sources on *Plexure*, opting in this case for a brightly evocative set of portmanteau artist credits: "Marianne Faith No Morrissey," "Sinead O'Connick Jr.," "R.E.M.T.V. Hammercamp," "Bing Stingspreen."

Plexure plays a game with tempo. Underlying its scattershot pop pastiche is "a pervasive and gradual acceleration," Oswald explains. "You could be tapping to the beat near the beginning, and then eventually encounter a psycho-physical dilemma as

Plexure is not just a parlor trick; it's a thoughtful attempt to demonstrate some observations about human perceptions. Oswald wanted to explore what he calls "the threshold of recognizability." "When does something become a permissible plunderphone, or a syllable of music that you can recognize?"

the music gradually becomes too fast for your foot. Because the acceleration is gradual, there's a tendency not to subdivide – in other words, to change gears. I've seen people get both feet going, and then their hands and fingers jump in, and by the end they're just vibrating. It's music for becoming a nervous wreck. How's that for an endorsement?"

Plexure is not just a parlor trick; it's a thoughtful attempt to demonstrate some observations about human perceptions. Oswald wanted to explore what he calls "the threshold of recognizability."

"When does something become a permissible plunderphone, or a syllable of music that you can recognize?" he asks. "I remember hearing these contests on the radio in which a dozen bits of songs would be played consecutively in the space of a few seconds, and the task would be to identify them – 'In order, please!' And suddenly, there are half a dozen callers with the correct answers. It's not like 'Name That Tune' – these bits are too short to indicate melody. These contests are amazing. All you need is a little clue. It's the sound of a particular drum and they way it's recorded that makes the difference. You need only hear the opening shot of 'Be My Baby' and the whole song rolls out in your mind.

"In *Plexure*, there are so many points of initiation that the sense of familiarity is confounding – your memory gets morphed. But there are potentially hours and hours of pop information encoded there, ready to be triggered."

Grateful Dead bassist Phil Lesh, a fan of *Plunderphonic*, persuaded his bandmates to let Oswald into the band's archives to collect materials for an hour-long plunderphonic called *Gray Folded*. It encompasses 25 years of live performances of the Grateful Dead's improvisational mainstay, "Dark Star."

Consisting mostly of stereo tapes from live performances, plus a few solo instrumental and vocal passages from multitrack concert recordings, "Transitive Axis" (the first half of *Gray Folded*; the conclusion is in the works) is very definitely a John Oswald composition and not a composite performance. It's a Tralfamadorian recap of the entire history of "Dark Star," freely interposing and intertwining episodes from Grateful Dead performances. "It's not a performably possible version of 'Dark Star,'" Oswald notes. "You can't have three generations of Jerry Garcias live on stage together – but there's this illusion of it being the Grateful Dead playing in concert."

Oswald listened to more than a hundred performances of "Dark Star," which is not as boring as it might seem to the uninitiated. "Dark Star" is the merest structure of a song, which the Dead have used as a framework for insanely varied improvisational flights.

It was the perfect subject matter for Oswald's experiment, offering a vast range of possibilities with a consistent set of musical touchstones as anchor points. "There's always something that hadn't happened before in 'Dark Stars.' I focused on the things that made a particular performance noticeably different from all of the other performances. I knew fairly early on that I'd be trying to make this Dark Star that focused on the exceptions rather than the rules."

As the best of the real-time versions of "Dark Star" have done over the years, "Transitive Axis" turns some interesting corners and traverses a multifarious musical universe; it's an audio mural depicting the most challenging regions of the Grateful Dead's musical frontier. "I've made a very unorthodox Dark Star," says Oswald, "but I haven't tried to submerge the performances under a lot of technique. I've tried to let the performances still speak for themselves." Oswald is at work on the concluding installment of *Gray Folded*, to be titled "Mirror Ashes."

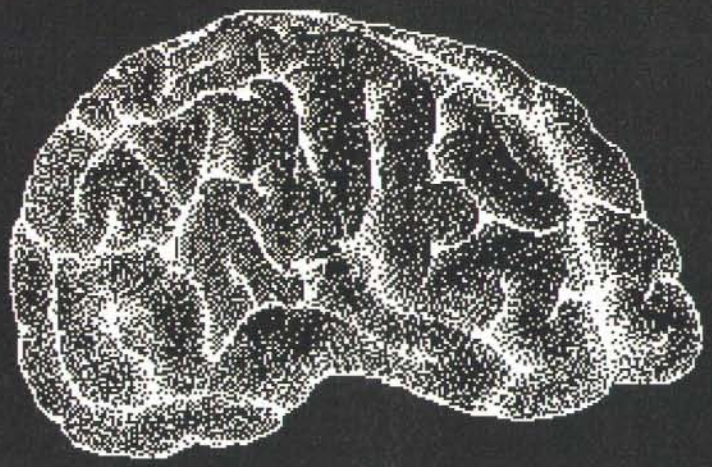
Oswald plays the saxophone, but only in improvisational settings.

Henry Kaiser, a prolific and globally appropriative guitarist, has been collaborating with Oswald off and on for 20 years. "He's a genius," says Kaiser of Oswald, "my favorite North American improvising saxophonist. He really improvises! He plays original, fresh ideas that have never existed before. With less effort, he could play completely normally, but he chose the path of creating music of the moment with a new vocabulary. He plays new ideas every time he plays, whether it's solo or with somebody else. It's not what the market wants, but it is the essence of music."

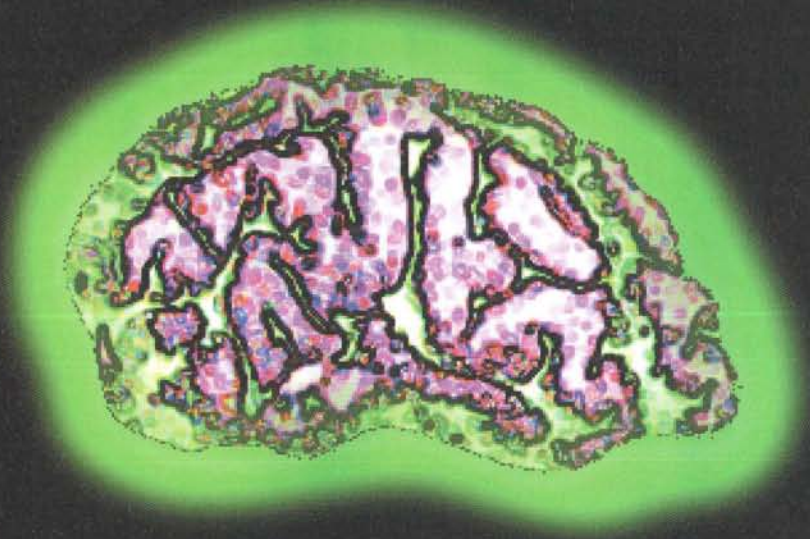
Oswald says he has no formal training and no interest in playing "normally." "I like improvising with people as a way of 181 ►



A note on the back cover of Oswald's vinyl album states that its contents are not to be bought or sold, but that "all forms of copying are permitted and encouraged."



brain



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Digital Fanzine

The publishers of *Blender* bill their creation, a music "megazine" on CD-ROM, as a pop-culture encyclopedia. The première issue offers exhaustive archives on celebs, such as a scowling Henry Rollins, captured in QuickTime vignettes. *Blender* conforms to magazine models, featuring text-intensive "front of the book" departments, a features well, and an astrology column. But it spices things up with music samples and surprise trapdoors.

Blender deserves high marks for relying primarily on



Low-grade footage.

original video material, and it has an in-group feel: scenes are recorded by Hi-8-equipped roving reporters. Unfortunately, the footage is not particularly riveting, and the dialog is often unintelligible.

On the CD, trendy display fonts juggled with textured screens can be darn hard to read. Also, the 10 seconds of "compulsory" advertising at the end of each section is highly annoying. Oh, and people, lose the dorky cartoonist! – *Ken Coupland*

Blender: US$19.95 an issue, or $49.95 for five issues. Dennis Publishing: (800) 825 0061, +1 (212) 302 2626, e-mail *blender@sonicnet.com*.

Winchell: An Unlikely Liberator of the Information Era

If you care about media, culture, or the real roots of the cyberworld, take a few hours of your time to honor and understand Walter Winchell, an unlikely father of the information age. He's an ancestor we might never think to claim – or want to – but one to whom we owe more than we might imagine.

Broadway columnist, radio broadcaster, FDR-New Deal supporter, anti-Nazi patriot, and, finally, right-wing journalistic flunky, Winchell altered American media for good by feeding the country's ravenous appetite for news and gossip about popular culture and the celebrities created by it. His life and times are brilliantly documented by Neal Gabler in *Winchell: Gossip, Power and the Culture of Celebrity*.

More than any other media figure (possibly excepting William Randolph Hearst, the great media schlockmeister), Winchell liberated entertainment and culture from the domain of media titans: his sensationalist gossip mongering struck a cord in the American public. He understood the intoxicating connection between cultural awareness and power.



Winchell won over the US public with a mixture of words, images, and technology.

If we could choose our liberators, Winchell probably would not have been one of them. If any life demonstrates that power corrupts, Winchell's did. Gabler paints a heartbreaking portrait of Winchell's personal ruin and political decline from populism and liberalism into McCarthyism. His name has become synonymous with exploitation, abuse of media power, and sensationalism.

But Gabler's perhaps too-long book is an important reminder of what Winchell wrought. The real roots of the exploding computer culture aren't only in MIT labs or hacker bedrooms, but equally in the far-reaching visions of Frankenstein-like innovators Winchell and Hearst. We are repulsed by their values, yet we are obliged to acknowledge them; their voices echo through our culture. Like the founders of our electronic information age, Winchell and Hearst tormented the pious and powerful to establish their own agendas, using imagery, language, and technology to connect with millions of people to whom nobody in media ever had much to say. – *Jon Katz*

Winchell: Gossip, Power and the Culture Of Celebrity, by Neal Gabler: US$30. Alfred A. Knopf: (800) 726 0600, +1 (212) 751 2600.



Sci-Fi Universe

Most sci-fi zines are bogged down in such a state of arrested adolescence that they're unreadable for anyone who's made it through puberty. To the rescue of thinking fans everywhere comes *Sci-Fi Universe*, a witty and informative jaunt through the many worlds of Jedis, Klingons, and Apes.

With an irreverence borrowed from *Spy*'s heyday and a layout that at times can be more confusing than dynamic, *Sci-Fi Universe* hit the mark the first time out of the gates. The première issue focuses on *Star Wars*, its past and possible present. Subsequent issues feature a review of the Trek universe from Gene Rodenberry's Utopian vision to Paramount's corporate theme-park incarnation.



Where Apes rule.

The joy comes from these writers knowing their stuff. Witness the sidebar in which Edward G. Robinson in Ape makeup and Rod Serling conspire to sell 20th Century Fox on some goofy premise about a planet taken over by apes. – *Todd Krieger*

Sci-Fi Universe: US$4.99. Available at newsstands in the US and Canada. Larry Flynt Publications Inc.: (800) 217 9306, +1 (310) 858 7155,

A Fabulous Waste of Time

There's a woman sitting in front of a TV. When you click on her head, it wobbles, shrivels up like a balloon with a fast leak, and sinks into a hole that has opened up where her neck used to be. Then, a creature looking very much like Edgar Allan Poe, but with the body of a chicken sporting a pair of diplomat's trousers, flutters out. And you'd better click on it before it flies off the screen – quickly, now, or you'll end up in the Penälty Bøx.

This is what life is like in the deeply deranged world of *Monty Python's Complete Waste of Time*. Monty Python's CD-ROM presents a multilayered, immersive world that's a little like that of *Myst*. The difference is that the world of *Myst* is eerie and haunting, and this one is insane.

Fortunately, it's all strange in the same way so you aren't lost in a chaotic structure. Instead, you get caught up in how parts are interrelated and weave together to form a whole.

Just about everything you click on does something unexpected. Chanting Australians emerge from behind the wainscoting. Cars screech across the living-room floor and plunge into manholes. Objects explode. Ambulances perform tricks. Bare-bottomed cancan girls fart demurely. And god help you if you press F1 for help.



Monty Python's off-the-wall interactive antics are uproarious on CD-ROM.

The real discovery on this CD-ROM is that Terry Gilliam's collage-based style of animation is perfect for the multimedia computer. It pushes the technology to a comfortable level, it looks great, and a quite a lot of it can be stored in relatively little space.

What Gilliam has done with it here is so weird and hilarious you almost resent having to give up space for the other multimedia goodies on the CD – clips from the TV show, sound bites you can add to your Windows environment, very odd screen savers, and a couple of silly but amusing games.

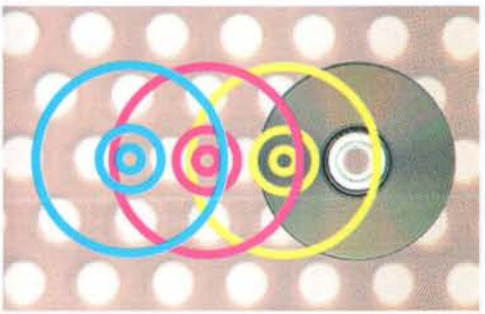
The clips of Monty Python's TV show are still fresh and funny after 25 years. Everyone I've shown this to has howled when a dirty vicar bellows "I love tits!" and hurls himself on a parishioner. And it's great to hear John Cleese sneer at me when I turn on my computer in the morning. The new work Terry Gilliam has done in putting this together is a revelation. – *Robert Rossney*

Monty Python's Complete Waste of Time for Windows: US$59.95. 7th Level Inc.: +1 (214) 437 4858, fax +1 (214) 437 2717.

Roll Your Own CD-ROM

Humble though your neighborhood Fotomat and Kinkos may seem, they occupy a key niche in the business ecology. In these service bureaus, expensive new technology can be offered at an affordable price, thereby establishing a foothold in the marketplace. They also serve as critical test sites, trying out new programs and machines and determining which ones are righteous workhorse tools. Back in the '80s, small businesses got their first taste of desktop publishing this way. Now, it's time for fledgling CD-ROM publishers to do the same.

There's a new breed of service bureau ready to make the jump to hypermedia: The One-Off CD Shop. Bring these folks up to 650 Mbytes of data and, in a couple days, they promise to send you home with an original CD-ROM. No matter what flavor CD you're interested in: audio, CD-ROM, CD-I, XA, Hybrid, or



Move over Kinkos, here come the service bureaus of 2000.

Mixed Mode, The One-Off CD Shop can serve 'em up.

Do they deliver the goods? I sent my local shop 12 Syquests of digital sounds, frame-grabs, and my entire collection of early QuickTime movies. A few days later, no muss, no fuss, I've got my own CD-ROM and, bubba, I'm one happy camper.

Costs, which are largely determined by your volume of data, range from US$100 to $200. The tab for my 500 Mbytes of data came to about $170.

So far, there are 10 specialty shops in Canada and the US. But keep your eyes peeled: a new One-Off CD Shop may be opening in your neighborhood real soon. – *Peter B. Sugarman*

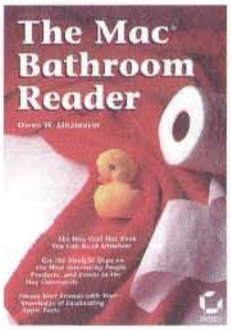
The One-Off CD Shops International Inc.: (800) 340 1633, +1 (801) 531 7585, fax +1 (801) 531 0740. Locations in the US: Minneapolis; Chicago; Huntsville, Alabama; White Plains, Maryland; and Scottsdale, Arizona. In Canada: Calgary and Edmonton in Alberta; Prince George, Coquitiam, and Richmond in British Columbia.

Beyond the Mac Hype

Behind this slightly outré title lies an amazing little book: Owen Linzmayer has done the best reporting on the history of the Mac to date. Rather than repeat myths recounted at length in numerous other books, he digs into the lore and provides interesting correctives.

There are great photos and lots of embarrassing quotes. Read stories of feuds and goofs involving industry insiders including Steve Jobs, John Sculley, and Jef Raskin (my face is red). Near-catastrophes and outright disasters abound.

Trivia question: What do Dianne Feinstein, Jim Henson,



Grimy truths surface.

Lee Iacocca, Sean Lennon, Stephen Sondheim, Ted Turner, Kurt Vonnegut, and Andy Warhol have in common? They all figured into the early history of the Mac (see page 110).

The book offers tons of fascinating random stuff and an extensive list of Easter eggs – hidden computer goodies – as well as the wizardry needed to conjure them onto your screen. I tried a few with great results.

This is one hell of a funny, informative, and iconoclastic book. Cheap, too. – *Jef Raskin*

The Mac Bathroom Reader, by Owen W. Linzmayer: US$12.99. Sybex Inc.: (800) 227 2346, +1 (510) 523 8233.

Tandy's Text-Typing Genius

Computers aren't known for how well they KISS (Keep It Simple Stupid). But back in 1986, some geniuses at Tandy made the Tandy 102, a legendary portable computer that to this day can slap a new PowerBook around.

I'd been looking in the paper for months when I finally found one for US$50 (that's not a typo). So what else is so great about this 8 1/2-by-12-inch box? Well, it lasts 20 hours on 4AA batteries; it has a built-in 300-baud modem; it weighs 3 pounds; it has a *really* full-sized keyboard (like a giant calculator on steroids); start-up is instantaneous; you can travel stress-free because it's too ugly to steal; you can add an acoustic coupler (I've heard of reporters who file stories from static-filled Russian pay phones with it); it has a transparent, condom-like encasing (writers I know have spilled full whiskey glasses on it without hurting a thing). This is genius!

There's no hard drive and no disk drive. In fact, the keyboard seems to be the only thing that moves, except for its 8-bit CPU and screaming 2.4 MHz processor that somehow keeps up with my typing. It uses text-based software stored in ROM and has an application for writing with cut, paste, and find – no spell check, but you can carry a dictionary and your pack will still weigh less than a PowerBook. It has a telecom application for



Listen up laptop manufacturers, the Tandy 102 wants to teach you to KISS.

downloading and sending data and a BASIC application for writing code and file management. Files are stored in RAM and kept there with a small hearing-aid-type battery. I bought an extra 8K RAM chip for $16.

Sure, the eight-line LCD display is small, but it works. Sure, it holds a finite amount of text, but you can modem files out, or use a serial port. You can also attach a 3 1/2-inch floppy drive and a television/video monitor. And, if you've completely lost your mind, it has a special port for downloading files onto an audio-cassette deck.

The manual, by the way, is a study in prehistoric, but surprisingly visionary, computer history. It points out that you can access over 100 BBSes in the country, gives detailed instructions on how to access CompuServe, and advises using electronic mail because it's faster and cheaper than the postal service.

As I use mine, I wonder, in this age of rampant gee-whiz technology, Why is some ugly old beige piece of plastic making me so happy? The answer is that its first, last, and middle name is "simple." I wish hardware developers would learn how to KISS better. They could make one of these in their sleep now, and I'd buy it in a second. – *Caleb John Clark*

Tandy 102, by Tandy Corporation: no longer sold; check classified ads for orphan processors.

The Cartoon History of the Universe

If you want to cram the 4 billion-year story of the living universe onto a few CDs, you'll need to oversimplify. Cartoons are the perfect creative medium for summarizing a story, and no cartoonist is as ambitious as Larry Gonick.

Gonick's celebrated collection of history comic books successfully moves to the multimedia realm on *The Cartoon History of the Universe* CD-ROM. This version clarifies and reinforces the many levels of his informative drawings: visual insights, scientific facts, footnotes, jokes, and silly anecdotes.

There is nothing quite like getting the teachings of Plato in a comic strip format. And it's not all highbrow stuff either. Gonick knows how to depict life in ancient days as seen from ordinary people in sandals. One has the sense of being in Rome, BC, and



So what if it's 'toons – this is a good way to teach history.

spying these cartoons as graffiti on a wall. The CD format adds color and the ability to mouse around into deeper interests easily. The CD also works for younger students who can't yet read, but can listen to the excellent audio track.

In addition, there are some "interactive" elements – a point-and-click 3D trip through a pyramid, for instance – that add vividness to the subjects covered in simple 'toon style in the main narrative.

Old fogies may object that this history is too entertaining. But the best thing that could happen to this disc is to get it banned from boring classrooms by professors who don't know a revolution when it hits them. *The Cartoon History of the Universe* CD is the first shot at ending the teaching of history as we know it. – *Kevin Kelly*

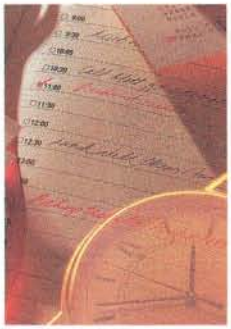
The Cartoon History of the Universe: approximately US$40. Putnam New Media: +1 (703) 860 3375, fax +1 (703) 860 3620.

Organize My Life

Go ahead and laugh: before I slipped the Claris Organizer disk into my Mac, I was using a clunky old Hypercard stack to manage my social calendar. My stack had all the elegance of a pig at a prom.

Organizer replaced all that crud with an unobtrusive floating menu bar that whisks me to relevant bits of info when I need them. Click on the calendar to make a date with Tawanda, and Organizer digs up all of my Tawandas and asks which one. To put Tawanda off another day, I just drag the name to another day, and my calendars adjust automatically.

As the day wears on, Organizer tracks the hours gone by with an ominous red stripe that creeps down the calendar's left edge. You can program alarms to nag you when you're falling behind, and To Do items trail you day after day until you check them off.



Intelligent scheduling.

I especially like the super-useful credit-card-sized address booklet printout for my wallet. Very cool.

Aside from a couple of interface quirks – such as a find command that retrieves unwanted information – Organizer is quick, thoughtful, and – thankfully – integrated. – *Mark Leabo*

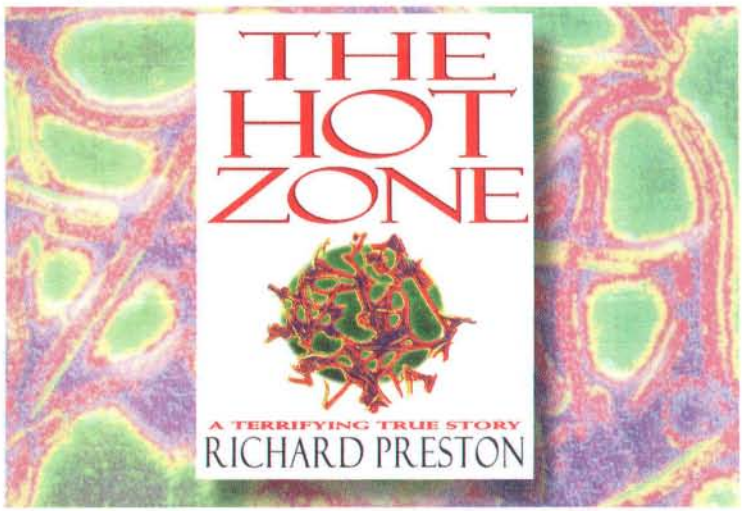
Claris Organizer for Macintosh: US$99. Claris Corporation: (800) 325 2747, +1 (408) 987 7000.

A Level 4 Biohazard

The rare times that I think of my demise, I try to picture it as peaceful, like going to sleep or something. Perhaps that's why I'm so completely horrified by the world of emergent killer viruses described in Richard Preston's new book, *The Hot Zone*.

The less-than-cheerful topic of *The Hot Zone* is the terrifying, real-life pantheon of newly discovered viruses. These "angels of death" are described in and around the true story of a 1989 outbreak of the Ebola virus in a Reston, Virginia, monkey lab.

Several passages describe, in the goriest detail imaginable, the process of succumbing to Ebola. Ebola, a filovirus, is every bit as scary as the extraterrestrial monster in *Alien*, and will do just about the same thing to a body, only it'll take about a week or so. The virus' outward signs begin with *vomito negro*, or "black vomit," and lead to the final stage, termed in virology circles as "crashing and bleeding out." In this stage, the victim's gut is sloughed and expelled, and the body collapses into a bleeding-from-every-pore pile of jellied gumbo. Hoo-boy!



A horrifying account of the 1989 Ebola virus outbreak in a Reston, Virginia, lab.

Filoviruses are classified as Level 4 biohazards, referred to in the vernacular as hot or extremely infective agents. We're talking spacesuits and military biohazard operations here. And worse yet, up until the Reston monkey lab incident, filoviruses were thought to be blood-transmissible only ... not, heaven forbid, *airborne!*

Preston's description of the drama that unfolded at the Reston lab is riveting from page 1 and never lets up. After reading the book, everything in my environment took on a new and disturbingly menacing tinge. I wouldn't recommend *The Hot Zone* for the faint of heart. However, those looking to be creeped out big time could do no better than to expose themselves to this infectious tale.

I think I'll go wash my hands now. – *Jim Leftwich*

The Hot Zone, by Richard Preston: US$23. Random House: (800) 726 0600, +1 (212) 751 2600.

Mickey Mania

There are only two things that make me cringe: TV commercials for feminine hygiene products and cutesy videogames so sweet you can feel your teeth rotting while you play. Yet somehow, *Mickey Mania*, the latest in a long series of games featuring Disney's ageless rodent, offsets its terminal cutesiness with incredible audio visuals and solid game play.

Programmed by Travellers Tales, which previously released three mediocre platform games (*Galahad, Puggsy,* and *Dracula*), *Mickey Mania* takes the player on a chronological tour of Mickey's most popular cartoons, from his début in the 1928 *Steamboat Willie* (which starts out with black-and-white graphics and slowly becomes colorized as you progress) to his most recent major appearance in the 1990 *The Prince and the Pauper*. Each level is filled with skillfully animated bad guys – created by Disney animators – and challenging action. With two dozen levels, umpteen tricky jumps, and several nasty end-of-level bosses, *Mickey Mania* is surprisingly tough – just the way I like 'em (but probably not well suited to kids much under 10).



Mickey's one tough dude on the game machine.

While the Super NES and Genesis versions of *Mickey Mania* are good, the Sega CD version is outstanding. It has orchestrated music (not the monophonic low-sample-rate crap you sometimes get with Sega CDs), a bonus level exclusive to the CD, and dozens of Mickey sound bites that infiltrate your brain, making you unconsciously repeat them while you play. (My personal favorite: the non sequitur "It's a moose!")

Like most games these days, *Mickey Mania* has an amusingly complicated "hidden" code that avid gamers may ferret out. To cut to the chase, here's the Genesis level skip code: go to the options screen, select "Sound Test," set the music to "Continue," set the sound effect to "Appear," set the speech to "Take That," move the cursor to "Exit," and hold the directional pad left for five seconds. Oh, sure, I could stumble on that by chance!

What really makes *Mickey Mania* a treat is that it never tries to be hip; it's just fun to play. Quite a radical concept! – *Zach Meston*

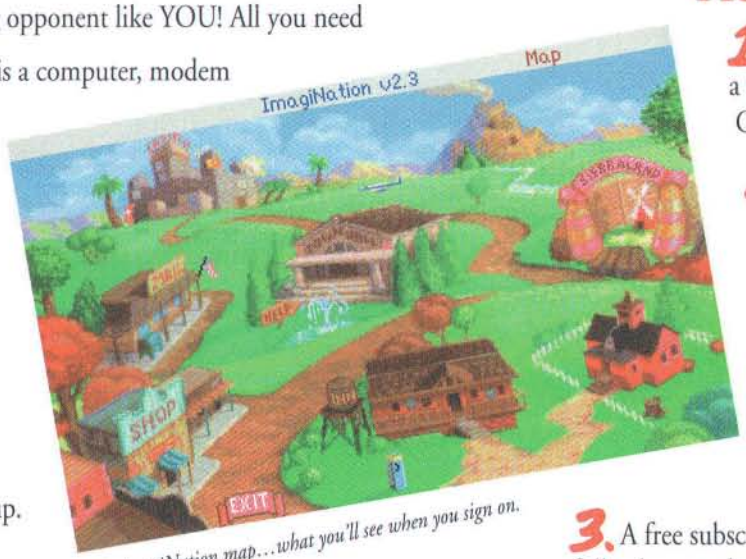
Mickey Mania: The Timeless Adventures of Mickey Mouse for Super NES, Sega Genesis, and Sega CD: US$59.95. Sony Imagesoft: +1 (310) 449 2999.

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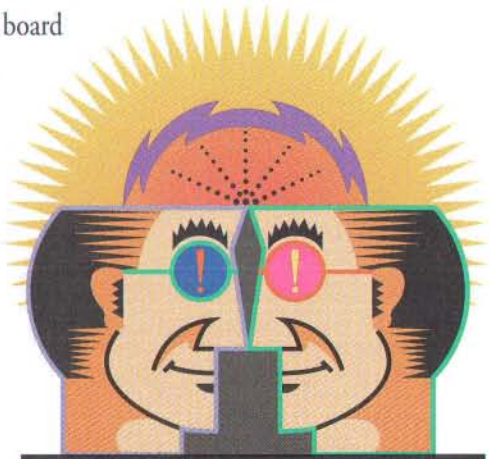
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Massive Attack

Protection
Virgin
Access Code 1244

The sound of Massive Attack, like all lasting, engaging music, is impossible to categorize. Not soul, hip hop, rap, blues, dance hall, dub, folk, underground, or commercial, it is all these things and more (the approach is like cinematic mood music). *Protection*, Massive Attack's latest release, is a sublime look at the dark side of soul music.

When *Blue Lines* débuted the band three years ago, critics the world over heralded it as one of the year's best releases. Epic-length singles "Unfinished Sympathy" and "Safe From Harm" dominated the UK charts. But the US never warmed to Massive Attack, and, following the surprise departure of vocalist Shara Nelson, the future looked bleak indeed. Fortunately, the vitality of their ethos did not rely on a single personality. Legendary Jamaican singer



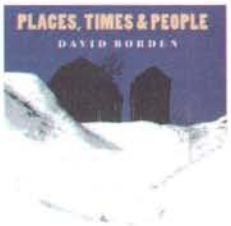
Horace Andy remained on board, as did the core trio of 3-D, Mushroom, and Daddy G. The band then enlisted Everything But The Girl's Tracey Thorn, rapper Trickey, and newcomer Nicolette to round out the vocals.

The sum of the parts – specifically Thorn's melancholy-cool delivery, Andy's spooky crooning, and Nicolette's self-described "Billie Holiday on acid" style – can hardly prepare the listener for the sumptuous whole. *Protection* features the tense, relentless rap track "Eurochild," a masterful dub-house reworking of Andy's "Spying Glass" punctuated by the profoundly unsettling instrumental "Heat Miser," complete with its rasping, iron-lung refrain. Only the throwaway dance-hall improv version of "Light My Fire" falls short of the mark.

***Protection* is a potent successor to the mighty *Blue Lines*. As always, the atmosphere is so well crafted and complete, it evokes an exotic, intoxicating, alternate reality. With an upcoming tour that includes an art exhibition, live performance, and possible CD-ROM and virtual reality installation, Massive Attack may yet succeed in bringing its sensurround soundtracks to the masses.**
– *Scott Taves*

David Borden

Places Times & People
Cuneiform
Access Code 1245



Minimalist composer David Borden's best compositions match those of contemporaries Philip Glass and John Adams, yet the fame those two enjoy has eluded him. Founder of the first all-synthesizer ensemble, Mother Mallard, in 1970, he's had plenty of time to develop his chops. *Places Times & People* is dedicated to those things near and dear to Borden's heart: it manifests the broad range of his talent, from works with spiky, yet fitting dissonances, to a Philip Glass parody. All of it fine stuff.
– *Dean Suzuki*

James Carney

Fables from the Aqueduct
Jacaranda Records
Access Code 1246



The music of James Carney, a talented pianist and composer in the acoustic, modal jazz tradition of the early '60s, reveals Pacific Rim influences of the West Coast's Ellis Island – Los Angeles. From the Copelandesque brass harmonies of "Hymn" to the New Orleans /gospel-flavored bounce of "Daryl & the God Squad" (shades of Miles' "All Blues"), sax masters Peter Epstein and Ravi Coltrane also dazzle. The delightful closer, "Surabaya," a nod to Coltrane Sr.'s "India," hypnotizes with a Balinese pentatonic scale that is sure to please. – *Will Kreth*

The Fatima Mansions

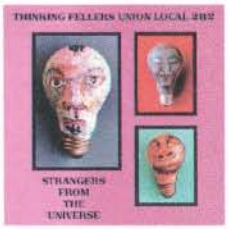
Lost in the Former West
Radioactive/MCA
Access Code 1247



Lost, The Mansions's second US release, is a major evolution of punk. It is a striking integration of techno-pop rhythms and ambient textures with dense, thundering, guitar-driven songs. The lyrics are filled with brutal political invective on the corruption and decline of church, state, and self. The raving is magnificent. It's easy to imagine the bile dripping from Cathal Coughlan's lips as he spits out each carefully crafted rant. Newcastle, England, must be a pretty bleak place to spawn this diatribe. – *Peter L. Herb*

Thinking Fellers Union Local 282

Strangers from the Universe
Matador
Access Code 1248



If the Thinking Fellers are math rock, why are they always getting such strange answers? With the equations they're pushing, a single mistake results in a massive string of glorious musical splat; the hands of five people, fiddling around with the hardware, squeezing their own versions of subtly enigmatic beauty into a squiggly mess of technicolor toothpaste. So many cooks, yet such a rich, unspoiled broth. The Thinking Fellers have not yet begun to think.
– *Patrick Barber*

Janáček: Glagolitic Mass

Kodály: Psalmus Hungaricus
The Danish National Radio Symphony and Choir,
Sir Charles Mackerras, conductor
Chandos Records



The superior original version of Czech composer Janáček's Glagolitic Mass has been reconstructed, and is recorded here for the first time. Preeminent Janáček conductor Charles Mackerras leads a stunning performance of this powerful, apocalyptic piece. Hungarian composer Zoltán Kodály's seldom-heard oratorio, *Psalmus Hungaricus*, commissioned in 1923 to celebrate the fiftieth anniversary of the founding of Budapest, rounds out the disc.
– *Bryan Higgins*

The Jazz Passengers

Jazz Passengers in Love
High Street
Access Code 1249



Before breaking rules, you gotta know 'em, and the Passengers' sixth – and first all-vocal – release proves they can do both. Serving up hard-driving bop with hot sax, vibraphone, and trombone, this "collection of short stories" is more like a subway car in which each rider grabs the mic: singers Mavis Staples, Deborah Harry, and falsettist John Kelly turn in stunning performances; sultry Jimmy Scott's "Imitation of a Kiss" is perfect. Varied, experimental, and playfully androgynous, *In Love* swan-dives through 70 years of jazz into a glittering new pool.
– *Colin Berry*

Various Artists

Respect to Studio One
Heartbeat
Access Code 1250



This succinct set covers the spectrum of sounds delivered over the last 35 years by the redoubtable Studio One label. These are crucial rhythms. From early ska sides like Bob Marley and The Wailers's "Simmer Down," to toasty classics from The Lone Ranger, Dennis Alcapone, and Michigan and Smiley, this music is pure cane sugar. Enjoy a parallel universe where Beatles songs are played with a lopsided bass, and Freddie McGregor and Carlton Manning move you to croon songs you didn't know you knew.
– *Dr. Rhythm*

Brecker Brothers

Out of the Loop
GRP
Access Code 1251



If you listen to top-40 radio on any given day, you'll likely hear Michael (saxophone) and Randy (trumpet) Brecker adding succinct, jazz-influenced solos to recordings by the likes of James Taylor and Paul Simon. But these are only bread-and-butter gigs – the brothers' real talent shines when they have a chance to stretch out in high-energy jams. Backed by a volcanic New York rhythm section, *Out of the Loop* indulges in the heat of the moment with emphatic, hard-core blowing over the hippest of funk grooves. – *James Rozzi*

Microwave O' The Month



MICROWAVED CD: LISA SEAMAN

Laibach
Nato
Mute Records
Big white guy with deep, bad German accent does slow rap thing that won't rhyme over Valkyries's crooning to beats of a Casio drum machine. Silk tapestries blow in wind smelling strangely like bratwurst. Yee-hah, Yankee pig-dog, smell my record! – *Elvis*

MUSIC ACCESS

If you'd like to hear excerpts from these discs,
call (900) 454 3277
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Touch Tone Required. US Only.
Under 18? Get parent's permission.

When prompted:
Enter Access Code (under the name of the artist).

Music Controls:
3-Fast Forward
4-Louder
5-Softer
***-Exit music/bypass most prompts**

A charge of 95 cents per minute will appear on your phone bill. An average call is about 2.5 minutes. Music Access samples for reviews in this issue are active January 7, 1995 – April 1, 1995.

At the beginning of each music review, you'll find a four-digit code for each album. To hear sample cuts, dial the 900 number above, entering this code when prompted. You'll hear up to three minutes of music at 95 cents per minute. To "fast forward," punch 3, for louder volume 4, softer 5. To use Music Access, you have to be at least 18, have a touch-tone phone, and dial from the US.

Code	Artist and Title
1244	Massive Attack, *Protection*
1245	David Borden, *Places, Times & People*
1246	James Carney, *Fables from the Aqueduct*
1247	The Fatima Mansions, *Lost in the Former West*
1248	Thinking Fellers Union Local 282, *Strangers from the Universe*
1249	The Jazz Passengers, *Jazz Passengers in Love*
1250	Various Artists, *Respect to Studio One*
1251	Brecker Brothers, *Out of the Loop*



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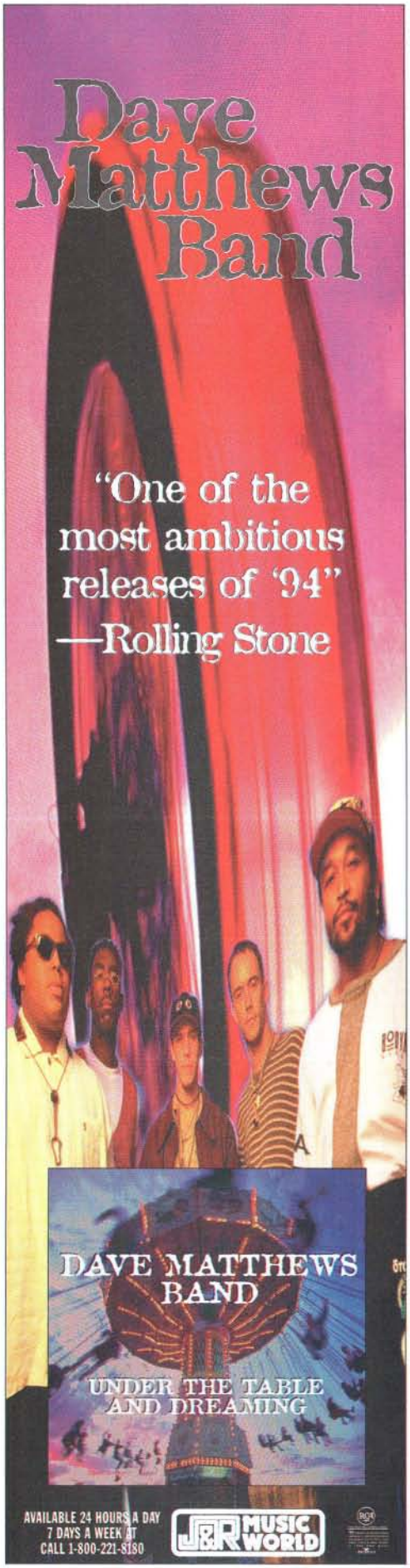
MENSA
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Gimme Earspeakers!

Since walkmans came on the market, most of us have forgotten about high-fidelity headphones. For more than three decades, Stax Kogyo has not. The Japanese company pioneered the development of electrostatic designs for speakers and "Earspeakers," such as the US$4,500 SR-Omega, arguably the best headphones in the world. Now, this superior performance is available on a more affordable $200 system, the SR-34 Professional Electret Earspeaker.

Unlike conventional dynamic-cone speakers, electret and electrostatic speakers have a flat, film-thin diaphragm suspended between parallel conductor grids. Because the diaphragm carries a constant charge, applying the music signal's fluctuating voltage to the grids moves the diaphragm to and fro, producing sound. Dramatically lighter than a cone, this diaphragm is extremely fast, resulting in low distortion and remarkable detail. You hear the vocalist's breathing and every creak of the cellist's chair. Stax's Earspeakers reveal how poorly most music is recorded – but they can bring tears to your eyes when you listen to the good stuff.



Hear a musician's every exhalation and slide on the guitar in incredible detail.

Low bass on electret speakers is often diminished because the design limits the diaphragm's expansion. Stax's headphones are no exception, but most ears will accept the trade-off.

Electrostatic and electret earphones are not for everyone. Stax phones are dipoles, which radiate sound in both directions – in this case, out as well as in. So, if you want to give your roommate some peace, stick to dynamic speakers.

Also, their operation requires high voltages (but at safe, low currents) from a sizable adapter. Stax's electret adapter must connect to the speaker terminals of your amp or receiver (it switches between the Earspeakers and your loudspeakers if you have no amp terminals to spare).

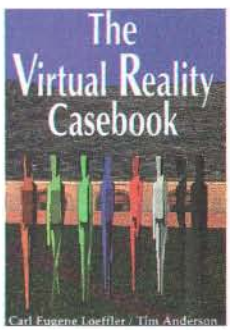
This may mean that your Earspeakers are not mobile. But their faithfulness to the recorded music and amazing precision assure that, if you close your eyes, they'll take you wherever you want to go. – *Joe Wiesenfelder*

SR-34 Professional Electret Earspeaker: US$199.95. Stax Kogyo Inc.: +1 (310) 538 5878.

All Things Virtual

Scan your local techie bookshop for VR literature, and you'll likely find superficial paperbacks and academic conference proceedings. Newly released, *The Virtual Reality Casebook*, edited by Carl Eugene Loeffler and Tim Anderson, is a godsend for those who want the straight dope on what real folks are doing with VR.

Casebook goes far beyond biomolecules docking into cell receptors, or simulated "shoot-downs" of (insert latest regional conflict identifier here) pilots. It features chapters on the arts, education, social, and cultural issues, and a number of projects around the globe.



Straight dope on VR.

Best of all, there's a huge bibliography, including a list of resources on the Net. And many essay authors list ways to contact them.

On the not-so-great side, the chapters are often too short; I would have liked more detail. Also, the section on VR abroad overlooks France and the UK.

But these are minor failings. *Casebook* is a first-rate Baedeker for navigating the field of VR. – *David Voss*

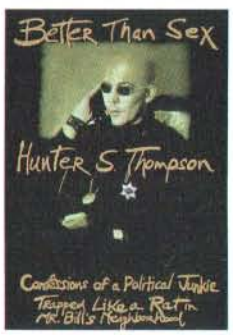
The Virtual Reality Casebook, edited by Carl Eugene Loeffler and Tim Anderson: $US29.95. Van Nostrand Reinhold: (800) 842 3636, +1 (606) 525 6600.

Worse Than Impotence?

With all the credibility of a trembling, wild-eyed junkie promising you that *this* time he's really quit, Hunter Thompson earnestly insists that his latest tome, *Better Than Sex*, is his last book on politics. Maybe he realizes he's run out of things to say.

This book tries too hard. It's twisted like one of those come-clean confessionals that Watergate felons penned in prison when they found Christ; and twisted like warped humor that wildly and awkwardly misses its mark.

Politics is the most powerful and harrowing of Thompson's many addictions, and it's a drug that let him down. The thrill of politics is a rush he claims can be better than sex.



A fiery burnout.

But *Better Than Sex* doesn't ring true as any sort of political exposé; Thompson is unable to overcome the reverent awe that drips from every one of his descriptions of men with Beltway power.

At times, the book rambles into self-absorbed musings. But Thompson has never been known for coherence. Passion is what made this guy the great icon of outlaw journalists – and that's what makes this book, despite its flaws, worth looking at.
– *Dave Dix*

Better Than Sex: Confessions of a Political Junkie, by Hunter Thompson: US$23. Random House: (800) 726 0600, +1 (212) 751 2600.

Digital Pinball

I hate most computer games. All those jet-fighter, starship, and find-the-treasure maze games bore me silly. The few computer games I do play are good enhancements of real-world games such as cards, dice, and especially pinball. There are two excellent digital pinball games available, and they're different enough that you might consider getting both.

Eight Ball Deluxe is based on an award-winning pinball machine from Bally. Like the original, the computer game is no-frills, meat-and-potatoes pinball in which you match your pinball skills and reflexes against the computer. Its designers deliberately ignored many newer game features – the screaming noise, ramps, and gewgaws that make pinball look like a loud miniature golf course. The computer game elegantly simulates those old-time pinball machines still found in true cowboy and biker bars.

Crystal Caliburn is a different beast altogether. It packs so many features onto its playing surface it's like a micro-amusement park at your fingertips. The graphics are lower resolution than the visuals of *Eight Ball Deluxe*, but the game makes up for it with a startling array of sounds: everything from dragon growls to cheering crowds to clashing metal and a range of imaginative "magic" sounds. *Crystal Caliburn* also features some weird play modes such as multiplay in which you bat around three balls at once.



***Eight Ball Deluxe* and *Crystal Caliburn*: nearly better than the real thing.**

Both games also let you use your space bar as a "bump" button, enabling you to use real-world hip action to move the ball. And both games tilt if you get too carried away. One nice feature of digital pinball is that, unlike regular pinball, you can pause both of these games in mid-action – even with the ball in play – and play later with all the motion and sounds intact. – *Richard Kadrey*

Eight Ball Deluxe for Macintosh and DOS: US$49.95. Amtex Corporation: (800) 810 7345, +1 (613) 967 7900. *Crystal Caliburn* for Macintosh and Windows: $59.95, $49.95. StarPlay Productions, Inc.: (800) 203 2503, +1 (303) 447 9562.

GET A NEW PERSPECTIVE ON YOUR MAC WITH SQUARE ONE.

You usually have two choices: a *million* files, folders and aliases in a mishmash on your desktop, or everything neatly stored away, so you have to do some **SERIOUS** searching to find what you're looking for.

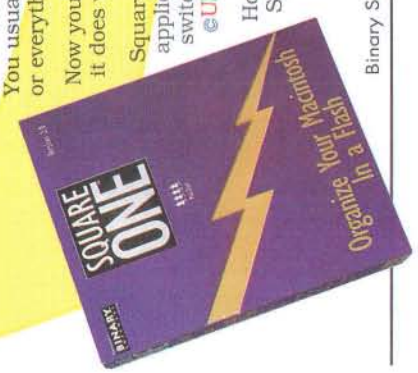
Now you have a better choice: **Square One**. *Macworld* called it "the **best** kind of utility software: it does what you want, when you want it." *MacUser* gave it ★★★★.

Square One is the best way to get your Mac organized and STILL open files, folders and applications—fast. It even keeps track of recently opened files in a document list, and lets you switch between running applications with a single click. The palette is **completely** customizable, and its icon in the menu bar means it's always at your fingertips.

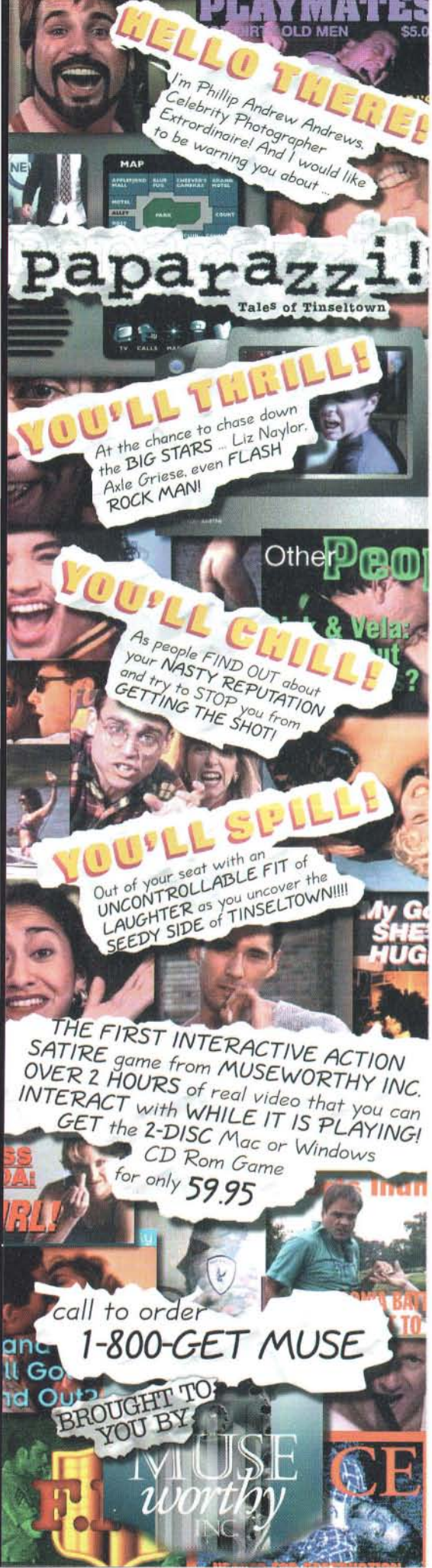
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1. Videogame Nostalgia

There's something depressing about the current wave of videogame nostalgia. Isn't the re-release of games like *Space Invaders, Pac Man,* and *Asteroids* tantamount to admitting that the best work of the genre has already been done, and that it consists of simple line drawings, cheesy sound effects, and no plots? What happened to those videogames that Electronic Arts promised would make us cry? Or the works of art Brenda Laurel keeps predicting? And, if we're going to admit the early '80s was the peak of videogame artistry, where the hell is the *Dig-Dug* remake?

2. Hip Multimedia Artists

Virtually every new technology firm claims that it, like the industry's pioneers, was founded in a Silicon Valley garage. But the multimedia industry refuses to follow this well-worn pattern. Instead of garages in San Jose, they brag of lofts in San Francisco and shoestring budgets. Instead of idealistic nerds, they're idealistic artists. But it's hard to swallow this artist image with so many Armani-clad venture capitalists and manipulative PR agencies swarming the industry. It's a prepackaged myth, shaped more by marketing than truth.

	Current Position	Position Last Month	Months on List
Videogame Nostalgia	1	–	1
Hip Multimedia Artists	2	1	2
Death of CD-ROMs	3	–	1
TV on Your PC	4	–	1
Books About the Internet	5	–	1

HYPE LIST

3. Death of CD-ROMs

Lost in the excitement over the Internet and online services, CD-ROM has been dismissed as multimedia's poor cousin. Many experts dubbed it a technology that missed its window of marketability. These industry pundits jumped the gun. CD-ROM drives are selling faster than accounts for online services, thanks to solid products like *Myst* and *National Gallery*. Because people are used to owning information, not leasing it, tangible forms of media like CD-ROM will be with us for a long time.

4. TV on Your PC

Back in the 1970s, when only geeks had computers and highways were strictly for cars, there was a hot new idea called "videotext." It was all about combining computers and television to deliver customized news to the home. And, except in Canada and parts of Europe, it was a complete flop. So I took the recent announcement by Intel and CNN of a video news service for computers as a belated entry in the '70s revival trend. I now eagerly await Intel's announcement of networked computing.

5. Books About the Internet

While I can't shed any new light on the debate over how fast the Internet is growing, I can safely tell you that the number of books about the Internet is doubling every month. Perhaps this excess of landfill is the book industry's way of thumbing its nose at pundits who predicted the Internet would kill print media. But who could have predicted people would buy books that are out of date by the time they are printed?

– Steve G. Steinberg **(hype-list@wired.com)**

A Feudal Life

All you need to win *Serf City* is a strong military.

This is easy. Just make sure your fiefdom's farmers are growing enough wheat to feed the hogs and keep the windmills churning out flour for the bakers. You need bread and meat for the miners – otherwise they'll go on strike. Those miners provide coal for forges, iron ore for tools and weapons, gold ore for paying soldiers, and granite for buildings. Anyway, eventually your well-fed and armed soldiers are supposed to crush your computer opponents.

Serf City is *Lemmings* with microeconomics. Or maybe it's *Sim City* with knights. Whatever this strange game is, it's hugely engrossing. You lay out roads, direct your serfs



Don't dally with pigs.

to construct buildings (there are 24 different kinds), and then sit back and watch as they go about completing their tasks. The forester wanders about plugging seedlings into the ground. Busy porters carry supplies from one building to the next.

Setting up armies is dangerously mesmerizing. Spend too much time watching the geologist dig test holes, and the armed forces of your neighbor will show up at your gates and hand you your butt.
– *Robert Rossney*

Serf City: Life Is Feudal for DOS: US$49.95. Strategic Simulations Inc.: +1 (408) 737 6800, fax +1 (408) 737 6814.

Where Slickness Fears to Tread

Finally, here's a magazine for anyone who has a soft spot for espresso, poetry, fiction, alternative rock, art, graphic design, or socio-political debate (c'mon, at least *one* of those must apply). *Plazm* – produced three times a year in Portland, Oregon, and boasting a circulation of 12,000 – calls itself "your rest stop on the information superhighway." The editors are not kidding: it's the first publication I've read in months that doesn't have a piece on Bill Gates or the intricacies of connecting to the Net.

What *Plazm* does possess is a commitment to publishing promising writers and visual artists who will part with their gems for *nada* (the magazine is a "nonprofit cooperative"). Contributions, mostly unsolicited, are esoteric at worst and stunning at best. Greg Carter's seemingly H.R. Giger-inspired computer illustrations definitely belong in the latter category, as does Jacques Flechemuller's powerful acrylic-on-board painting, reproduced in *Plazm* number 7. (It depicts slabs of nondescript meat interspersed with the words: "In 7 days I lost 5 inches off my waist and 10 pounds of fat, says Janette Conpar.") Writers



"Your rest stop on the information superhighway."

like Ken Foster and Rick Rubin may soon see literary agents lining up; their sparse, well-crafted fiction seems ready for the Big League.

Meanwhile, *Plazm*'s art director and co-founder, Joshua Berger, thumbs his nose at conventional page layout, arguing that "the clean grid of Modernity has been formally rejected by the nihilism of industrial youth culture." The result can be deliberately chaotic, at times hard to read, and a tad too close to David Carson's work on *Ray Gun* to be brutally original. But that's all right: Carson deserves the flattery.

Plazm* is *Mondo 2000* recalled from cyberspace, or *Rolling Stone* minus its greedy, marketing-powered heart. Those who like their magazines slick and formulaic are hereby given a last chance to change their minds. – *Rogier van Bakel

Plazm: US$4.49 per issue; US$12 per year. Available at Waldenbooks, Tower, Barnes & Noble, and Borders Books & Music. Plazm Media Cooperative: +1 (503) 234 8289, fax +1 (503) 235 9666, e-mail *plazmmedia@aol.com*.

netwe@r

A Hug and a Kiss and a Bright Red Rose!

Netwear is celebrating Valentine's Day by planting a big, fat, juicy Hug and a Kiss on you, and offering you a bright Red Rose.

These two new Emoticons, Hug and a Kiss and Red Rose, are perfect for a BBS buddy or chat room love slave.

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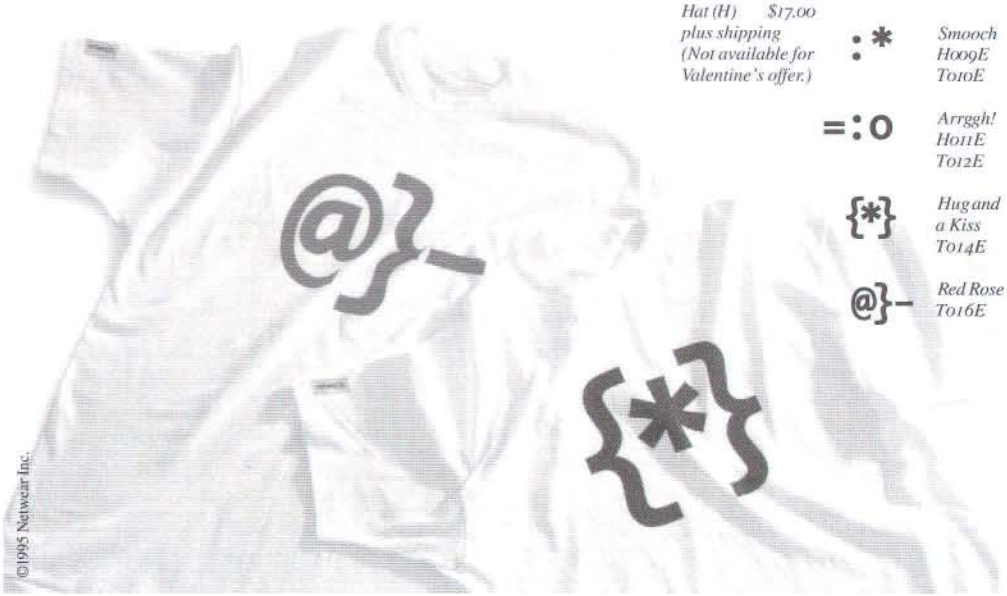
;) *Winky H007E T008E*

:* *Smooch H009E T010E*

=:o *Arrggh! H011E T012E*

{*} *Hug and a Kiss T014E*

@}– *Red Rose T016E*



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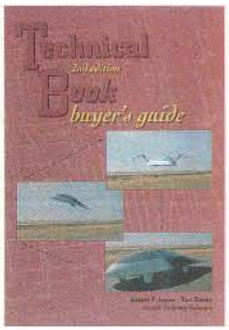
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Navigating Tech Books

Simply put, this erudite, eclectic, and lavishly illustrated compendium is a technical book buyer's *Whole Earth Review*. For every person who has ever dreamed of building an intelligent robot, discovering a new form of math, writing a fractal-paint program, radioing a Russian submarine, decompiling an integrated circuit, or draining a toxic landfill, this book is great bedside reading.

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The great recursive irony here is that the world has grown so complicated we need technical books and bookstores to collate and distribute facts and formulas to keep it all running. Now this technical information has become so voluminous that we need guidebooks to direct us to the appropriate books. What's next, guides to guides? – *David Thomas*

Technical Book Buyer's Guide, 2nd ed., by Gilbert T. Lopez and Tom Cloney: US$19.95. United Techbook Company: (800) 247 4808, +1 (303) 651 3184.

You Are Commodity

During congressional debates over the Clipper Chip and digital telephony bills, privacy advocates railed about the dangers of Big Brother listening in. Well, brother, you ain't seen nothin' until you get a look at *DM News*, the tabloid newspaper bible of the direct marketing industry.

DM News most recently emerged from its 15 years of relative trade-press obscurity when Representative Edward Markey (D-Mass.), chairman of the Subcommittee on Telecommunications and Finance, got wind of an America Online ad placed in *DM News*. The ad, touting the sale of AOL's million-member mailing list, triggered a congressional inquiry into online subscriber rights that spread to all the major online services.

After sampling a few issues of *DM News*, I've decided our privacy concern shouldn't be focused on Big Brother, but Little Brother. If Big Brother knew half as much about you and me as the Little Brother of private in-


DM NEWS

House May Abolish Committee That Oversees Postal Service

How many direct marketers have their paws on your stats?

dustry, we really would be in trouble.

The distasteful practice of collecting personal information, compiling it, and selling it seem abstract when all you hear are second-hand stories. But when you're staring down 50 pages of ads for mailing lists of every flavor imaginable, the enormity of the direct-marketing industry hits home.

Inauguration onto these lists begins at any stage of life. For example, businesses can buy a New Baby list of newborns and their parents. If the baby grows up to worship the 49ers, he or she may show up on the NFL Fan Mail file – a list of children ages 7 to 14 who write to their favorite NFL teams. Or if dolls are more the thing, perhaps the kid will end up as one of the 650,792 names on the American Girls list for purchasers of dolls, accessories, and clothing. The kaleidoscope of available lists is unending. – *Art Brodsky*

DM News: US$75 for 48 issues, or $2 for a sample issue. Mill Hollow Corporation: +1 (215) 788 5915.

Marathon Performance

***Marathon*, the latest Mac game from the company behind *Pathways Into Darkness*, comes on like a relentless, fuel-injected nightmare. The performance and intelligence of *Marathon* is so far ahead of the competition that its cliché story lines hardly enter the picture. For better or worse, I'm hopelessly addicted to this game – and I'm an adult! Did someone say *Doom*? I'd forgotten about that game.**

You are a science officer aboard the spaceship *Marathon* and the last hope against invading aliens. The aliens come in all shapes and sizes – freaked-out mutant ninja insectoids, robed faceless floaters, and search-and-destroy slugs – and all are intent on the ship's crew. Amid throngs of panicking crew members (if they're in your way, kill them too), your weapons experience is a blessing as you battle with foes that possess some wicked artificial intelligence. In your battles, helpful hints are transmitted via computer terminals. Your AI-imbued guardian angel, Leela, can also come to your aid. The only problem is that she has a malfunctioning evil twin who inter-



Doom fanatics: meet the competition.

cepts proceedings at damn inconvenient times.

The seemingly limitless range of motion and viewing perspectives in *Marathon* are unmatched. Look up, look down, race all over the place, and ready your choice of tasty weapons on the fly. Let a rocket go at an alien's feet and that nasty thing flies straight up in the air. Use your grenade launcher in a tight space and you're liable to find yourself on your back, dead as a doornail.

Macintosh's architecture problem, which hampers the speed of most games, has been ingeniously overcome. Don't ask how; just enjoy the ride.

If you have access to a Power Mac Ethernet network, you may have to quit your job. To say the network experience is engaging would be a drastic understatement. Up to eight players can run wild on the decks of the *Marathon*, guns blazing, rubbernecking to see who has a bead on their butts.

***Marathon* is accelerated for the Power Mac and it screams. Hell, even I screamed a few times.**
– *Scott Taves*

Marathon for Macintosh: US$69.99. Bungie Software Products Corporation: +1 (312) 563 6200, fax +1 (312) 563 0545, e-mail *Bungie1@aol.com*.

Street Cred Contributors

Patrick Barber wonders what it would sound like if all the cars stopped. He is a writer.

Colin Berry *(cpberry@aol.com)* clutters the pages of *Option, Ray Gun, SF Weekly*, and the upcoming *Happy Mutant Handbook*.

Art Brodsky is a senior editor with *Communications Daily* in Washington, DC.

Amy Bruckman *(asb@purple-crayon.media.mit.edu)* is a graduate student at the MIT Media Lab where she researches virtual communities and education.

Caleb John Clark *(calebjc@aol.com)* is a writer who has just moved into the heart of North Beach and feels like he's been hit in the forehead by a wonton out of a slingshot.

Ken Coupland writes about emerging trends in technology for a variety of international design publications.

Peter L. Herb *(plherb@aol.com)* is a New York attorney who plays guitar and can be found most weekdays wearing a bow tie and suspenders.

Bryan Higgins *(bryan@well.com)* plays the French horn and clavichord, writes fiction and software.

Alastair Johnston is a printer and graphic design teacher who broadcasts over the San Francisco radio waves as "Dr. Rhythm."

Richard Kadrey *(kadrey@well.sf.ca.us)* is senior editor at *Future Sex* magazine as well as author of the novels *Metrophage* and the forthcoming *Kamikaze L'Amour*.

Jon Katz *(JDKatz@aol.com)* is media critic for *New York Magazine*. He was formerly a reporter and editor for *The Boston Globe, Philadelphia Inquirer, Washington Post*, and *Dallas Times-Herald*.

Todd Krieger *(tkrieg@eworld.com)* is a reluctant nomad in search of the perfect chili dog.

Mark Leabo *(markleabo@aol.com)* is a comedy video producer, freelance writer, and ex-airline pilot. His hero is John Waters.

Jim Leftwich is principal of Orbit Interaction, a design consultancy specializing in user interfaces in Palo Alto, California.

Zach Meston *(vgzach@delphi.com)* resides in Hawaii and writes videogame strategy books for a living, a lifestyle combination that makes most people insanely jealous and physically ill.

Jef Raskin *(raskinjef@aol.com)* created the Macintosh computer project and plays the contrabass recorder in F.

Robert Rossney writes the Online column for the *San Francisco Chronicle* and is still looking for a reason to buy a CD-ROM player.

James Rozzi *(rozzij@mail.firn.edu)* is a freelance writer, woodwind musician, and teacher in the Orlando, Florida, area.

Steve G. Steinberg *(tek@well.sf.ca.us.)* is a computer science student and editor of *Intertek*, a technology and society journal.

Peter B. Sugarman *(peterS10@aol.com)* is a reconstituted TV producer, an unrepentant HyperCard developer, and the co-creator of *Beyond Cyberpunk!*

Dean Suzuki, PhD, teaches music history at San Francisco State University, with an emphasis on 20th-century music and rock history.

Scott Taves *(staves@aol.com)* is the director of Reactor Sound, a new record label in Chicago. He's partial to machine music.

David Thomas writes a column on alternative entertainment and culture for the *Denver Post* and does many other things that don't sound as exciting.

David Voss *(dvoss@aaas.org)* fled a cushy job in physics to become a senior editor of the journal *Science*.

Rogier van Bakel *(rogiernl@aol.com)*, as anagram enthusiasts will note, has Brave Ink Galore. He is a Dutch correspondent in Washington, DC.

Joe Wiesenfelder is a freelance writer specializing in audio and video. He has never met a VCR he couldn't program.

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net surf

Edited by Kristin Spence

The Maltese Chat Line

It was a dark and stormy night. I hadn't seen rain like this since that Key West stakeout back in '89. With the scream of ones and zeros whipping back and forth, my connection was made and I was one step closer to her. She had called it *Homer* and said I would find it at *sumex-aim.stanford.edu*. It was the Internet Relay Chat program that would deliver us from ASCII flatland. Sweat beaded on my forehead.

I found the program in the *Macintosh* directory under *Communications*. The download took some time – it was a 2-Mbyte file. I clicked on the icon, and music as ominous as a paddy wagon siren played. A logo appeared with the word "Homer," shining above what appeared to be the view from inspiration point – a grid of city lights under a night sky. I wondered why she had been so insistent on using Homer tonight. We'd been flirting dangerously since July, but now, she said, there was a better way to communicate – a graphic interface that would give us greater capability. (Capability for what, I wondered....) My trigger finger twitched. It does that when I get edgy.

I cinched my collar against the cold and logged on to my shell account. I opened a connection to an *IRC* server in central Florida. Zap! The program worked its magic. A sleek console appeared, screen buttons and readouts telling me which users were on my channel and how to send private messages with the click of a mouse. This was graphic interface heaven!

Nightlady and I had set a clandestine e-date: she'd told me to join channel XTC to find her, and there she was – but not just in ASCII this time; instead, a synthesized computer voice matched each word she typed, and her image, those sultry baby blues looking back at me, appeared in a small window on the left-hand side of my screen. I told her she looked better than I'd imagined. She said I looked worse. "Cringe :)" I typed. I'd been on a monthlong bender of no sleep, strawberry Pop Tarts, and bad videos. But what did she care?

Over the course of the next six hours, Nightlady and I exchanged our best lines and talked about the weather in Bora Bora. We exchanged GIFs. It would have been perfect, seamless, but I had to bozo-filter a coupla dames I'd met on other channels. Lucky for me, Homer had an "ignore" command in one of the pull-down menus, and a server-ignore program that came in handy if the dames changed their screen names – it worked as well as a bad attitude. The time came to sign off. Nightlady told me to meet her at the café on Third Street, 9 p.m., tomorrow. It was time for us to meet in the meat, flesh to flesh, IRL – the ultimate graphic interface. As her name disappeared, a logoff message blinked onto my screen, "You're actually better looking...." I smiled and took a bite of Pop Tart.

I switched channels and ran into a snitch I'd worked with in the past. I told him about Homer. He agreed, Homer was fantastic. I promised him a Jackson and he spilled that there were other hidden commands available. He was pretty cagey about 'em, but suggested I hit *tab, delete, tab, delete,* and wait for a message from a lurking friend. "Toby Smith, the author of Homer, will have a new version out soon, so check sumex," the snitch told me. Bleary-eyed, I said good night, thanked her, logged off.

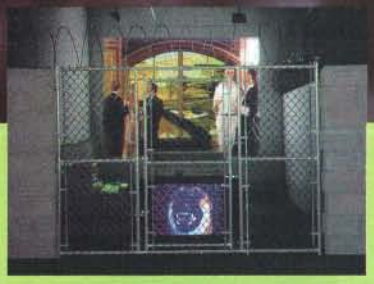
The next night, I wound up at the café, looking for Nightlady. I waited 30 minutes. Just as I was ready to go home and curl up with some takeout, a delicate hand touched my shoulder; a woman's voice huskily spoke my name – and I knew I'd come in from the rain. – *Elliott Stone* (digipub@netcom.com)

And Now for Something Completely Different

Contrary to popular belief, accents *do* color ASCII. Witness *alt.fan.british-accent*, an incontrovertibly ducky newsgroup replete with Anglophilic enunciation and British politesse. ("I'm bored. Let's start an utterly pathetic flame war.") It's absolutely fabulous.







For Fluxus Web pages (top and bottom) go to http://www.panix.com/fluxus. Want more? Try http://www.wimsey.com/Pixel_Pushers (middle).

To Market, to Market, to Play with Your Stocks

With all the global data floating around on the Net, you'd think you could make a killing in the market. Well, maybe not, but a slick Web site called *QuoteCom* tries to make it easier to gather streetwise info to monitor your portfolio. It also offers an e-mail *Quote Server* (for the Internet-less) as well as a daily message that tracks stock performance (updates and "alarms"). It's not free, though, and you will be warned about the financial service ads you'll get every few weeks. If you subscribe to all their services, you could rack up US$130 in fees every month. Basic service goes for $9.95 a month and carries a limit of 100 quotes per day. The full boat gets you Standard & Poor's reports, BusinessWire, Hoover Reference Library, lots of news releases, and access to historical data – neat charts too, if you're running a GUI browser! While probably not for the novice investor, QuoteCom could be valuable for those with a growth stock mentality. To register, surf to *http://www.quote.com/register/reg-new.html*. Non-Web travelers can either *telnet* to *quote.com* and *login* as *new* (password *user*), or *ftp* to *quote.com*. Web folks should open a connection to *http://www.quote.com/*.

Let Your Fingers Do the Webbing

The World Wide Web is definitely going legit – even Ma Bell's mapping it! AT&T now offers *800 Directory Information* on the Web at *http://att.net/800*. Companies are listed alphabetically from "A&A Antenna and Satellite Systems" to "Zytron Sports Injury Products." If you're not satisfied with what your search uncovers (or if you just want to make those operators do a little more work), clicking on the *related* button will pull up a list of similar businesses. You can also browse by category of business, and even find out where each outfit is based. Take as long as you want – there's no operator here. This is definitely one to add to your hotlist. Now if someone could just get these Web clients to dial the phone....

Yo! Einstein!

You don't have to be a rocket scientist to find *this* site on the Web. *Rocket Science*, the new game company that produces cool stuff for all CD-ROM platforms (see *Wired* 2.11, page 108), is up and running with its own virtual truck stop, where all Rocket Scientists congregate – and a beautifully designed, fun corner of the Web it is. You can link to discover who and what this great outfit is all about – hell, even send 'em a copy of that résumé you've been too nervous to put in the mail. Make a fashion statement with *Rocket Science Gear* (available only in cyberland) or link to *Cadillacs and Dinosaurs* – a place to see stills and MPEG movie clips from Mark Schultz's inspirational series, or to get tips from expert players. Be the first on your gossamer thread to explore the initial episode of Ron Cobb's new story, or check out a sneak preview of what's to come from these brain boys. (You'll also find links to *Clement Mok* designs and the *Internet Literacy Consultants*.) A definite hotlist addition for any serious gamehead. Toggle on over to *http://www.rocketsci.com/* and blast off.

Fresh Goes Better with Life

Grab some sugar, glucose syrup, hydrogenated coconut oil, gelatin, dextrin, natural flavor, corn starch, and gum arabic, mix well, and what do you have? Probably a lot of pretty scary substances, but how many of them could claim to be "The Freshmaker?" The above are the diabolical components of ... Mentos – that hybrid gum/candy touted in those totally random TV ads. And, as you may have guessed, there is indeed a *Mentos FAQ*. (A sign of the apocalypse perhaps?) Maintained by Purdue University grad student Heath Doerr, the Mentos FAQ contains plot synopses of those wacky commercials, jingle lyrics, and way too much information about the candy. Says Doerr: "I have received no input from the manufacturer (Van Melle Inc.), but I've considered sending a copy to them to see if I could get a free case of Mixed Fruit. But the whole thing is sort of a parody of Net culture, so unless they were cyberpunks, I don't think they'd get the joke." If you want to get the joke, send *e-mail* to *mentos-faq@fische.com*; or access the FAQ via *ftp* at *ftp://ftp.netcom.com/pub/asuter/coolstuff/mentos.faq*.





Best Served Cold

Plotting revenge, are you? Don't do anything drastic until you've consulted *alt.revenge*. Here, you'll find vindictive, cathartic suggestions that range from the mechanical (thermostats, water pumps, fuel tanks) to the psychological (crank phone calls, foreign shades of lipstick artfully applied to your victim's collar). Post at your own risk – instant karma may just get *you* in the end.

Tapping in

In their quest for precious ground on the Net, many corporate advertisers are jumping at the chance to claim a strand of the Web. Miller Genuine Draft ("MGD" for short, if you're, er, "hip") is no exception. The Miller folks have cluttered their *Tap Room* with a plethora of colorful, slick graphics meant to seduce young Web crawlers into pulling up a bar stool. The site is a collection of Letterman-generation ad-copy speak, peppered with various editorial pieces written by "expert lifestyle reporters" from US alternative weeklies in the cities you'd expect. Read about female club DJs, skating, hockey, cocktail/swing culture in San Francisco, or regional social issues. The stories – mildly engaging for a young mind, perhaps – are pretty lite (like the beer). Miller's trying hard to build a community feel here, but it's difficult not to be skeptical. Check it out for nothing but the survey question, "Do you drink straight from the container or pour your beer into a glass?" (link to *Speak Easy*). Stagger on over to *http://www.mgdtaproom.com* if you're curious or want to give 'em a piece of your mind. But remember: no drinking and navigating. And never use a glass.



Way Cool Web Site from the President's Office. NOT!

Crank up your Web browser of choice and link to the latest from the White House. Wait for a 68,643-byte picture to load, then check out the administration's disclaimer abdicating responsibility for everything as well as the description boasting of an "enhanced interface...." (God, I love bureaucracy!) What do Clinton's minions call the site? An *Interactive Citizen's Handbook*. For real! They have the whole enchilada: audio, pictures of the Prez and Veep, a hotspot graphic of the White House with links to *The First Family, Tours, Publications, Guest Book, Comments,* and the *Vice President's Welcome Message* (more powerful than Valium). Just think of it: with the White House on the Net and Georgia's Newt Gingrich in the Speaker's seat, the 535 members of the US Congress can't be far behind. We bill it as the Battle of Narcissus and Sisyphus – or maybe "Synapse Collapse in the Senate." Either way, you'll find it at *http://www.whitehouse.gov/*. (Don't miss Socks's 15 minutes, either.)

Wipeout

Regarding the astrology page blurb we ran last issue ... we seem to have lost a case-sensitive letter in the editing process. The correct address for the page is: *http://cyborganic.com/~justin/astrol* (that's with a lowercase "j"). Apologies for the inconvenience.

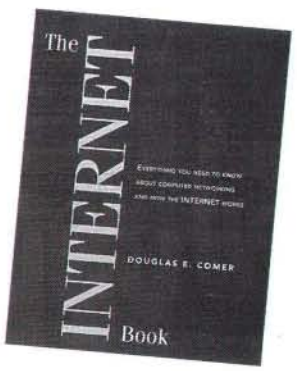


Wanna cavort with Mark Schultz's Jurassic Mr. Goodwrench? Go to *http://www.rocketsci.com* and link to *Cadillacs and Dinosaurs*.

Thanks to the *Wired* 3.02 Surf Team

Amy Bruckman *asb@media.mit.edu*
JC Herz *mischief@phantom.com*
John S. Makulowich *makulow@clark.net*
Dan Sicko *reverbmag@aol.com*

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netiquette

>On December 2, a reader chastised:
>Dear Diva,
>I've noticed that a few magazines these
>days are giving out personal e-mail
>addresses like candy. Usually, these
>addresses are printed under the names of
>*private* citizens who are contributing to,
>say, the letters to the editor section. Do
>cyber rights include privacy rights? What if
>readers express an unpopular opinion, or
>perhaps get their facts wrong? They could
>be sprayed with flames until their mailbox
>is a charred, unuseable minefield.
> You don't do that to snail mailers, why
>do it to us?
>Signed,
>Burnt to a Crisp

Dear Well Done,
First of all, you can drop the persecution complex. Do you *sleep* at flamebroiled @sequestered.com? Do you house your *children* there? Your most precious belongings? Unless you're a member of some kinky cult I haven't been invited into (highly unlikely, doll), your comprehensive answer would have to be "No."

Wake up and smell the new age, sweetie. It's a brave new world out there, and, in it, e-mail addresses are being exchanged like cheesy business cards at a trade show. It's the default, not the exception. As a result, it's best to treat it like you would your phone number: if you don't want it to be public, for god's sake be proactive and say so. And if you cast an opinion out there, you'd better have the balls to hold it up.
Net.hugs,
Dame Raquel, Network Diva

>On December 7, an irritated reader ranted:
>Dear Diva,
>Here's one for ya: four-line .sigs.
>It appears that since the second
>installment of Net Surf (_Wired_ 1.5, page
>116), you at _Wired_ have been condoning
>one of the grossest violations of accepted
>netiquette – namely, .sigs that are more
>than four lines long. Your ".sig o' the
>month" feature seems not only to condone
>such reprehensible behavior, but to offer
>an open invitation for net.newbie.bozos to
>come up with even more lame BUAGs.
>Explain yourself!
>Signed,
>Four on the Floor

Dear Doggy Style,
If you'll notice next time you're lurking about in net surf, .sigs of greater than four lines are termed "Random ASCII art o' the month." Heaven forbid we should condone reprehensible manners! (It's my reputation that's online, dear.)

It is indeed poor manners to clutter the Net with BUAGs (here termed Butt Ugly ASCII Graphics). BUAGs take up precious bandwidth, and for those who must pay to download their news, or who have slow connections, receiving 50-plus megs of .sigs (most of questionable quality) can quickly raise the ire.

And, hon, you really need to release some of the hostility I'm sensing. See a therapist. Or travel to alt.fan.warlord and chuck a virtual tomato. It will do you *and* your complexion a world of good.
Net.hugs,
Dame Raquel, Network Diva

>On December 9, a reader warned:
>Dear Diva,
>It's OK to lurk. We enjoy having people
>watch us talk. You can lurk to your heart's
>content and no one will bother you, or
>care. But once you post, you'd better
>understand the consequences.
> If 1 million people read alt.whatever at
>once, it's not a problem. But if 1,000 people
>post at once, it is sure to kill the group. For
>chrissake, show some restraint!
> Let me be even more specific: if you're
>posting to a group because you heard
>about them in, say, _Wired_, lurk for a bit.
>And realize that if too many of you post in
>the same time frame, you'll kill the very
>thing you're exploring.
>Signed,
>Knock It Off

Dear Chip,
Well, sweetie, once I waded through your attitude, I could see that there was a kernel of a point there (pun intended).

Yes, lurking is a handy little trick; a sort of unobtrusive means of entry into various subcultures. Would you travel to a foreign country without knowing a thing about the language? Or the culture? (Oh, scratch that. For a moment I forgot I was addressing Americans....)

Listen up, sweeties: grow some respect and lurk before you leap. Otherwise, that "me too" post you feel compelled to make just might be your last.
Net.hugs,
Dame Raquel, Network Diva

>On December 11, a concerned reader
>condemned:
>Dear Diva,
>G'day! I'm an academic/commercial
>Internet user from Australia. My petty
>gripe is that people who use the Internet
>to correspond seem to think that the rules
>of grammar, spelling, and vocabulary
>should be thrown out the window in the
>interests of freer, more creative expression.
> The notion that the Internet should have
>its own rules of expression is conceited in
>the extreme.
>Signed,
>Grammar Guardian

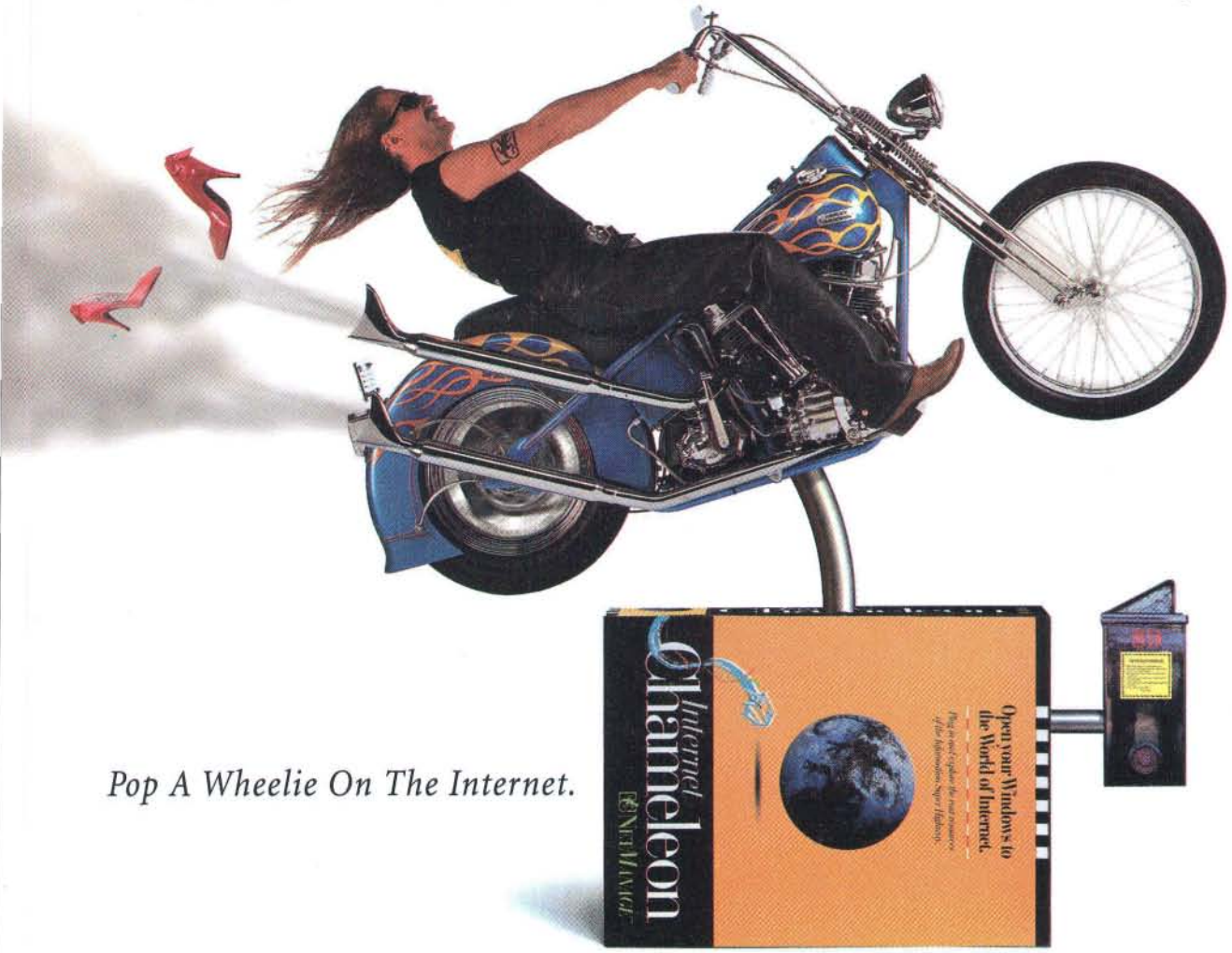
Dear Grams,
Hi yerself. Now set down the Foster's and think for a moment. The Net is a new frontier. Historically, frontier settlers abhor imposed boundaries. Same applies here.

Freedom and ease of expression are crucial aspects of Net culture. But, the Diva *does* share your love of language deftly executed. Corresponding online combines the best aspects of letter writing with the immediacy of a phone call. Concentrating on the immediacy and forgetting the literacy can have disastrous consequences.

Have patience with these souls. Public schools are a bitch, sweetie. Understand that the Net is a home-rebuild (engine), running on the high-octane fuel of its own rules of expression – anything goes! But you too are a mechanic of the system: Why not bore out some pistons? Why not drop in a Rolls Royce fly wheel? You might be surprised at the mileage (and passengers) you'll get.
Net.hugs,
Dame Raquel, Network Diva

Got a question about netiquette? Perhaps a gripe? Write Dame Raquel, Network Diva at netiquette@wired.com. (*And don't post with your mouth full, hon!*)

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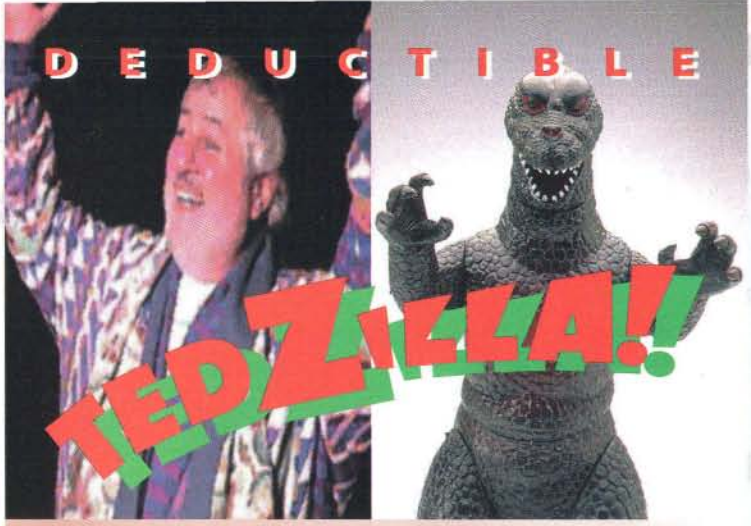
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If You're Headed to Monterey for TED6

Monterey perches at the southern tip of a crescent-shaped bay just over an hour south of Silicon Valley. But the town is pure sea lions and Steinbeck, not one byte of silicon. And although modern Monterey suffers from a bad case of touristitis, the peninsula remains an exquisite landscape of rolling hills, gnarled cypress forests, and vertigo-inducing sea cliffs.

Pick a designated driver – someone to watch the road – and venture down the sweeping coastline. Procure picnickings at the **Mediterranean Market** in nearby Carmel, and drive 45 minutes south to Big Sur. Or trade your Budget for a bike – the majestic Point Lobos is an easy 3-mile ride from Carmel.

Oodles of otters and other marine mammals frolic along the coastline, site of a national marine sanctuary and a living promotion for the **Monterey Bay Aquarium**. In addition to the three-story Kelp Forest and bat-ray petting pool, don't miss the Monterey Bay Aquarium Research Institute show on Thursdays and Fridays at noon. The institute's submarine research vessel explores Monterey Bay canyon, an undersea chasm, and transmits live video footage via microwave link to the auditorium. Look on as researchers discover bizarre, previously unknown creatures of the deep.

Back up at sea level, take in a weekend matinée at the **Dream Theatre**, which is modeled after a 1930s movie palace. The theater features foreign flicks and artsy movies. Couples curl up in the love seats, but there are lounge chairs for not-so-chummy conference-goers.

When the curtain closes, walk over to **Ferrante's** in the Marriott Hotel for a drop as the sun slips down over the Pacific. When the colors have faded, move on to **Fresh Cream**, which all agree is the best restaurant in town. Look out over the moonlit harbor as the aroma of lobster ravioli and, later in the evening, Grand Marnier soufflé, envelops the small dining room. **The Rio Grill**, a southwestern sojourn just a short drive away in Carmel, is a livelier spot serving smoky, grilled entrées with just enough spice to justify another frozen margarita.

In the moderate range, the funky Monterey **Samsara Café** serves a mostly vegetarian menu from breakfast until 11:30 p.m. and offers a full espresso bar, not to mention the Black Water special. If jet-strength coffee isn't your cup of tea then try **Morgan's Coffee and Tea**. At this dig, Darjeeling is dull – try a pot of the Pinhead Gunpowder.

Although the Monterey Jazz Festival is months away, you can catch a few riffs at **Doc Ricketts' Lab**, a basement club named after an eccentric local biologist of the Steinbeck era. In the interest of science, test the Tweaker in a Beaker, a specialty of the house. Doc Ricketts' features live bands, from rock to reggae, seven nights a week. But on Saturday night, stop by the **Tyler Street Bar and Grill** to see Alligator and the Bayou Boogie Band, a local zydeco group. Gator taught Jimi Hendrix how to play the guitar with his teeth and behind his back.

If you catch the spirit of Monterey and want to *do* something for the area, visit the **Monterey Brewing Co.**, which donates a percentage of the sale of every Save the Whale Pale Ale to the cause. – *Jessie Scanlon*

Kelp tanks of thanks to Mason Killebrew and Jocelyn Williams.

JUNKETS

February 9-19
VideoFest '95; Berlin
VideoFest '95 will emphasize interactive media, with seminars and workshops on CD-ROM production and the Internet. As usual, the main program presents the best video art, documentary, and computer animation work of the year, with several projects from Eastern Europe. Academics, computer artists, and filmmakers will critique the past 30 years of media art and look to the future. Registration: around 15DM (US$10). Contact: +49 (30) 2 62 87 14, fax +49 (30) 2 62 87 13, e-mail *vf-info@contrib.de*, WWW *http://info.archlab.tuwien.ac.at/~katz/finemedia/FM_Web_Pages/Videofest.html#ViF.*

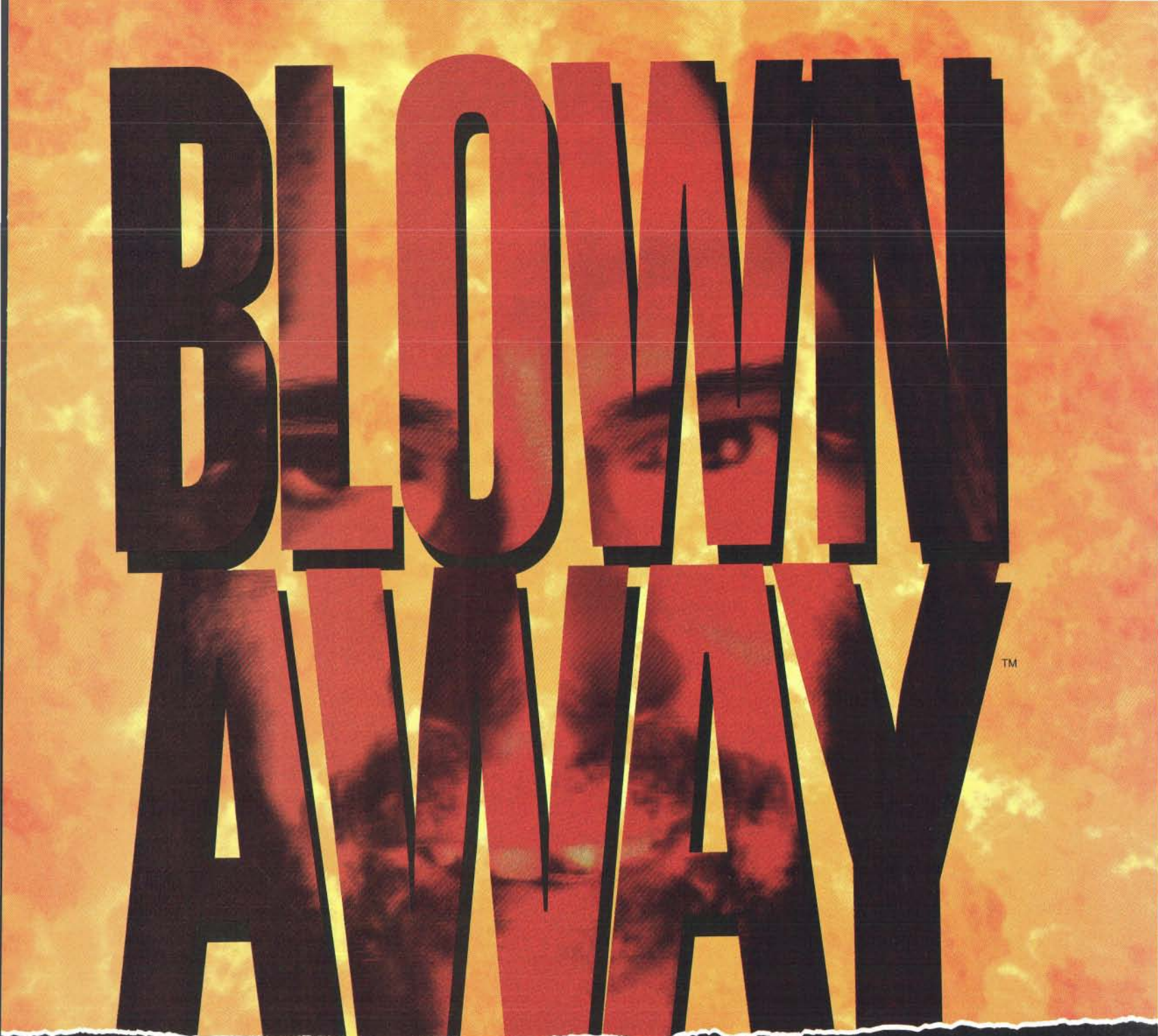
February 22-25
TED6 Conference; Monterey, California
TED6 will close the popular series devoted to the convergence of technology, education, and design. This year, yet again, the list of eclectic speakers will make you drool: Douglas Coupland, Frank Gehry, Stephen Jay Gould, and Kai Krause, among others. Participation by the equally illustrious audience will be the icing on the cake. And don't worry, the TED creators are already working on two new events: TEDWELL and TEDSELL. Registration: US$2,000. Contact: +1 (401) 848 2299, fax +1 (401) 848 2599.

March 5-8
PC Forum; Phoenix, Arizona
It's time to bite the bullet and subscribe to *Release 1.0* (US$595 a year) if you want to attend PC Forum, Esther Dyson's conference for the digital élite. As the "Local to Global" theme suggests, *la crème de la techno-crème* will discuss how communications technologies are redefining our concept of community, with emphasis on the implications for global business. Registration: US$2,600. Contact: Daphne Kis, +1 (212) 924 8800, fax +1 (212) 924 0240, e-mail *daphne@edventure.com.*

March 23-24
Commerce and Banking on the Information Superhighway; Chicago
Personal computer sales average 200,000 a week. Four million people subscribe to an online service. More than 50 percent of the hosts on the Internet are commercial. And even the conservative banking industry is catching on. Leaders of Citibank, among other big suits, will join with cyber-entrepreneurs to look at the future of banking. Keynote speaker Tim Jones, the CEO of Mondex, will discuss its digital cash project, which is scheduled to launch in the UK this year. Registration: US$1,195. Contact: Gregory White, +1 (312) 540 3010, fax +1 (312) 540 3015.

March 28-30
ETHICOMP95; Leicester, England
This year marks the maiden voyage of ETHICOMP, an academic and industry forum to discuss the ethical questions raised by information technology. Papers and workshops will cover the ethics of the Internet, viruses, and hacking; issues raised by the existence of accounting and medical databases; and other digital dilemmas. Registration: around US$350. Contact: Simon Rogerson, +44 (533) 577475, fax +44 (533) 541891, e-mail *srog@dmu.ac.uk.*

March 28-31
Fifth Conference on Computers, Freedom and Privacy; Burlingame, California
Modern technology has thrown a virtual wrench into the Bill of Rights. Accepted concepts of speech, assembly, and property must be redefined for the digital age. CFP '95 will consider these and other issues, such as commercial life on the Net, telecommuting (tele-exploitation?), universal access, and netiquette. Registration: price unknown at press time. Contact: fax +1 (415) 725 1861, e-mail *cfp95@forsythe.stanford.edu.*



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Align and Conquer

◂ 117 is 28 GHz. That's huge. It's gigantic. If you can get that to work well – and be interactive, too, which we have high hopes for – then it has the capacity for as many channels as you want. If that develops, we won't have to build out all the other things.

But by whatever combination of means, we will deliver broadband services to all of our customers within the next 10 years. We'll deploy it in each location and each market differently, depending on the economics. But we will deliver it to all of our customers.

Why deliver it through the TV? Many would argue that the PC is a better vehicle for these services, and some even predict that by 2000 the PC will be the dominant interactive appliance in the home.

That's not going to be the case. I think they're missing the whole point, because you're going to have intelligence in the home. The intelligence, of course, could be a set-top box or a personal computer. In fact, the PCs that will come out in the next few years will be able to act as a set-top, once they figure out what the interactive set-top will look like. And all it will take is a wire from the one to the other to make that intelligence energize the tube. But you're not going to watch television on a little monitor. You're going to watch it on a big set. That's what you'll use when you want entertainment, and you'll use the PC and keyboard when text is more important.

So you're going to have both in many houses. But even in 2000, you'll still have 75 percent or more of the population that doesn't have a sufficiently intelligent PC to handle the kind of interactive services that we'll be able to offer over television sets.

The other thing to keep in mind is, the real diffusion rate of PCs into the home is not progressing the way people say it is. They talk about the number of PCs shipped each year, and there are a lot of them. But many of them are seconds and replacements. What percentage of the homes in Pittsburgh today, for instance, do you think have have a 486 PC in their residence?

Based on the best estimates I've seen, which put total PC penetration at somewhere around 25 percent of American homes, I don't know – 4 to 5 percent maybe?

That might be my guess, too. Don't forget, when they call and ask, "Do you have a PC?" many people will say yes. But what they've got is some old Amiga or 286 or something. There's no doubt that the number of more powerful computers is going to grow, but there's a stupendous amount of churn in those figures about PC usage in the home.

And remember, it's also a demand question. More people want entertainment. You've got to start with entertainment – entertainment-on-demand, time-shifted sports and time-shifted news. And people will be able to get all that without having to put a $2,000 PC in the house.

So it's the Willie Sutton factor? You know, the bank robber who, when asked why he robbed banks, answered, "Because that's where the money is."

Exactly. Why TV? Because that's where the people are.

Ameritech recently announced it expects to see 20 percent of its revenues coming from video. Do you have similar goals for your joint programming venture with Nynex, PacTel, and The Creative Artists Agency in Hollywood?

How can I answer that? I mean, everything's up in the air. There'll be new competitors in every field. So there's no way I can answer that question.

Will video transport turn voice transport into something that's too cheap to meter? What will happen when someone wants to receive a data service via your video network at the transport cost of video?

As a theoretical question, I see your point. And I can imagine at some point we'll need to provide cost breakdowns to our regulators. But right now I couldn't tell you what video transport versus voice transport will cost, say, five years from now. But I can envision one day offering various packages of services. And one of them might be a package of video and interactive services in which the customer also gets phone service for another two or three bucks.

All right, before we end, could I conduct a little free-association thing with you? Kind of a Rorschach test, you might say. You game?

OK.

All right, here's the first one: Bill Gates?

Jane Seymour.

Pardon me?

Jane Seymour.

I'm sorry, I don't –

I saw a movie last night with Jane Seymour in it. She's been on my mind. She's intelligent and beautiful –

[Laughs.] OK, I get it. Now, everything's not going to come up Jane Seymour is it?

No, sorry. Go ahead.

OK ... Bill Gates?

Many more billions to make.

The Internet?

Unruly wave of the future.

Electronic Frontier Foundation?

[Pauses.] One of many.

Government regulation?

Barriers coming down.

Your worst business nightmare?

Government regulation.

Equal access?

All for it.

That's interesting. Because you and the other Bells have been accused of red-lining – of concentrating your roll-out efforts on more upscale and whiter communities.

You know, that's an absolute red herring. Lord knows where it comes from. Have you looked at our demographics?

Yes, and truthfully, the demographics in your proposed service areas show not only higher minority representation than in your region as a whole, but higher than the country as a whole, too.

That's right. So the only thing I can think of is that because the first location that we requested was in New Jersey, somebody may have looked at that one town and said, "Aha! Red-lining!"

Has the coalition – you know, the Center for Media Education and the Consumer Federation of America – since retracted its charge?

Retracted? Of course not. Never in the history of any coalition has *that* happened!

OK, one last question: How do you expect the provision of video content and interactive services to change your company? Is Bell Atlantic really prepared to shed its old monopolistic ways to compete in this new world?

I'm not sure anyone is able to fully appreciate how powerfully the openness of these new networks is going to affect our lives. All I can say is we'll do our best to meet the challenges as they come.

Oh, I know what they say about the old Bellhead mentality – and it's absolutely true! I remember the old days in the '60s when we had a rule for everything, including the correct way to hold a pencil. We even had a written rule that said, "Before you go to a meeting, always go the bathroom, even if you don't have to."

Well, those days are gone, at least here at Bell Atlantic. It's become clear that all the old givens – like "monopolies are forever" – no longer apply. Which is why we've been working very, very hard for more than five years now to transform ourselves.

The world's changing, and we intend to manage that change in a powerful way. It's really that simple. ■ ■ ■





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WILL MORE OF THE SAME EVER WIN THE WAR AGAINST DRUGS?

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Chess Master

◄ 123 several "plys" into the match and ascertain a winning endgame before your opponent does.

But it is a mathematically defined path nonetheless. While in the heat of a match, chess might seem the most human of all games, one that pits one person's intellectual mastery, strategy, emotional, and even physical stamina against another's. But, fact is, machines play chess better than most of us.

And by the end of next year, they'll probably play better than all of us.

"That's impossible," Gary Kasparov once retorted when asked if a computer could beat him. Even after losing to a computer in blitz, Kasparov still assumes the role of knight in shining armor against the Silicon Monster, and to many chess players, he's defending the belief that chess is uniquely human.

"The real fight will be action chess, 25-minute games," Kasparov claimed last June. Yet, soon after that – in September 1994 – Kasparov lost at action chess to a commercial software called Chess Genius. Presaging the final loss, Kasparov's dark eyes widened as his voice rose to this proclamation: "In serious, classical chess, computers do not have a chance in this century. I will personally take any challenge."

Such a challenge looms. A championship match between the 1995 World Chess Champion (it may or may not be Kasparov, who is the 1992 champ – the cycle is three years long) and Deep Blue, IBM's specially programmed computer said to represent the pinnacle of artificial chess intelligence, is expected some time this year.

Blitz is a fast, relentless game. But classical chess matches exhibit the deepest and most creative championship chess playing. When he has two hours to make all of his moves, Kasparov is sure he can plan and execute strategies that are beyond any computer's range of calculation.

"Chess gives us a chance to compare brute force with our abilities. Playing such a match is like defending humanity," Kasparov says. "Indeed," he continues, sounding like a student of science fiction, "I think this match will tell us more about future conflicts with computers."

"I like to win," smiles Feng-Hsuing Hsu. The frumpy Taiwanese computer scientist calls himself "a toy maker," but his "toy," Deep Blue, is nearly ready to play the decisive match. Grandmasters laughed at computers until four graduate students at Carnegie Mellon University scraped together a prototype in 1985. Three years later, Deep Thought quashed that laughter by trouncing a grandmaster at a tournament. Kasparov beat it in 1989, but its descendant, Deep Blue, may prove to be Kasparov's true Silicon Monster.

Deep Blue has a database of endgames it uses to play flawlessly when only five pieces remain on the board. When Kasparov beat Deep Thought in '89, this database had not yet been published. But now every grandmaster knows the score: if, during a match, Deep Blue searches several plays deep and finds a way to reduce an endgame against a human to a winnable configuration of those five pieces, the machine simply will not lose.

Grandmasters laughed at computers until four graduate students at Carnegie Mellon University scraped together a prototype in 1985. Three years later, Deep Thought quashed that laughter by trouncing a grandmaster in classical chess.

"It's not fair," Kasparov complains of the database. He wants to ban it from the impending match. But in a characteristically creative attack, he also proposes an intriguing alternative to an outright *nyet*: "Why doesn't the human have the same access to the database? I can have a Newton!"

He has a point. The database allows Deep Blue to make precise, random-looking lines of play far beyond the abilities of any human. Indeed, computer science's crunching of endgames has led to solutions of chess problems humans have puzzled over for hundreds of years. ("Two bishops against a knight is something that the human race has been struggling with for almost 200 years," says Hans Berliner, an early leader in computer chess now teaching at Carnegie Mellon. "Now a computer has worked it all out.")

But no computer can calculate such a long series of moves in the middle of a game. Therein lies the crux of Kasparov's argument: Deep Blue won't be *playing* the endgame, but rather *calling up prior calculations.* But Kasparov doesn't dream up his own brilliant endgames on the spot, and the creator of one of the databases 168 ►



Chess Master

◂ 167 Deep Blue employs, Ken Thompson, responds to Kasparov's complaint with a question: "He has a huge library in his head. Are the computers not allowed to use it?"

Fair's fair, right?

"The less Kasparov knows about what we're capable of, the better," laughs Deep Blue's Hsu. Yet, prior knowledge of Deep Blue's capabilities is no laughing matter for Kasparov. What if he has no practice against his Silicon Monster? What if he never even has a chance to study its games? Though he claims he will take any challenge, Kasparov is more cautious than he once was. Almost angrily, Kasparov lays down a ground rule for a future clash: Deep Blue must defeat lesser grandmasters before he will play it. "It has to play some games. To play *me*, in a serious event, they have to prove it can beat other players."

The world chess champion has the power to make such decrees. And when Deep Blue plays, Kasparov and his coaches will carefully analyze its every move. "We'll study it," Kasparov says, and with the knowledge he gains through the study of Deep Blue's games, he will form a strategy.

In the 1950s, it seemed that if computers could play chess, then the human mind might be better understood through processes defined by chess software. "Chess is generally considered to require 'thinking' for skillful play," wrote Claude Shannon, known as the father of computer chess, in 1950. A machine capable of beating grandmasters "will force us either to admit the possibility of mechanized thinking or to further restrict our concept of thinking."

Kasparov disagrees. "Chess is not mathematics," he insists. "Chess is fantasy; it's our human logic, not a game with a concrete result. Mathematically, it cannot be expired. The number of potential chess moves exceeds the number of atoms in the universe. It's a number beyond any possible calculation. Theoretically, it's unsolvable."

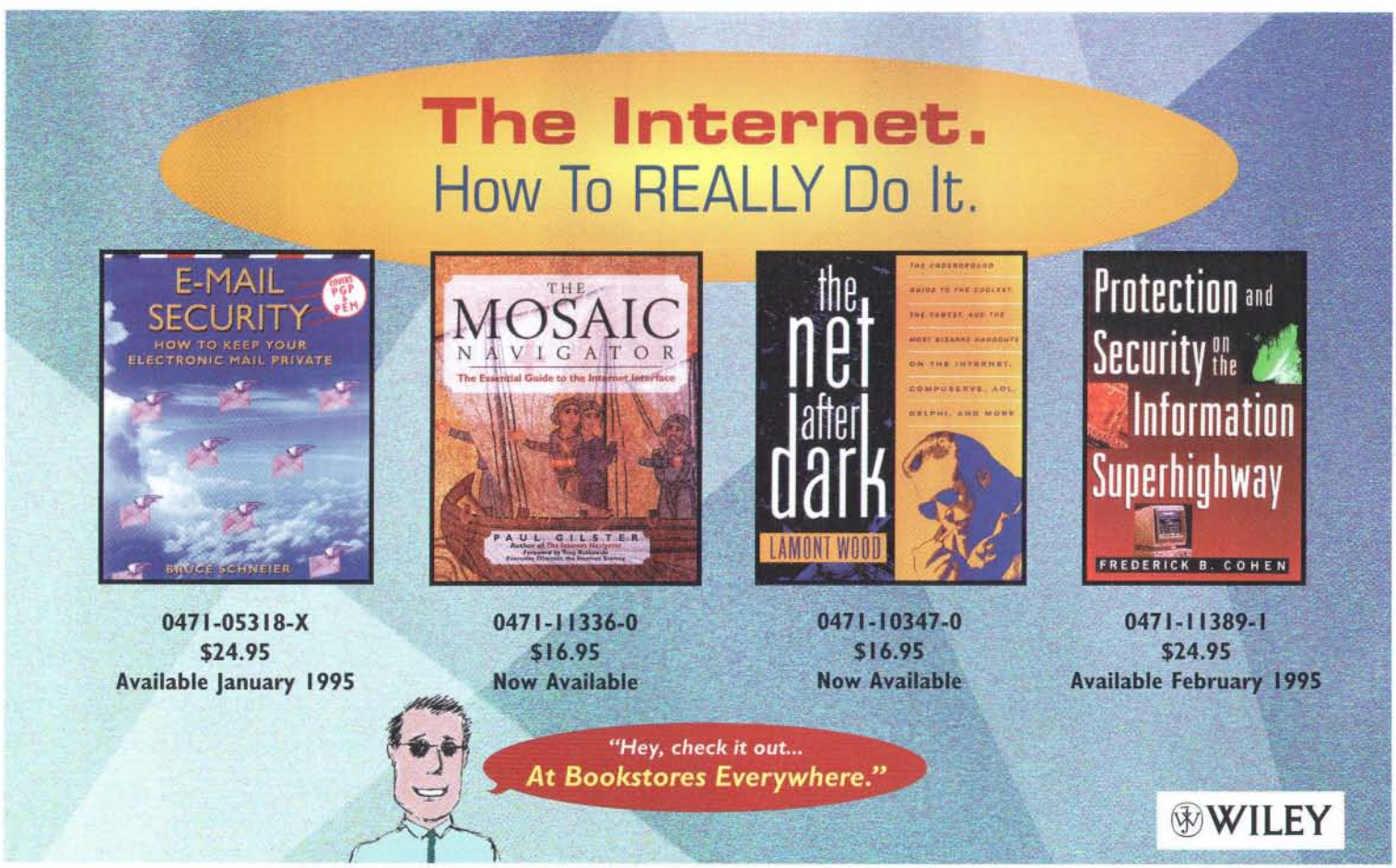
Kasparov adds passionately, "Chess is not pure calculation." And this is true for humans. From Baku, Azerbaijan, 10 years ago, Kasparov fought his way to the top of the chess world. Now an international star, he earnestly suggests he could beat his Silicon Monster by increasing the number of brain cells he uses to calculate moves. But, however much he hopes to upgrade his mind, Kasparov's nearly black hair isn't hiding a rapidly evolving brain.

Deep down, Kasparov the skilled provocateur knows that humanity is indefensible against Deep Blue.

Frustrations, fears, superstitions, pressures, psychology, even the prize money of a tournament have power when a human sits down to sweat and angst over 64 black-and-white squares. Humans sometimes make mistakes. Humans can psyche each other out. When the battle of wits is over, humans can shake hands and say, "Good game. We'll meet again." But computers do not dwell upon yesterday's defeat, and they never have good or bad games.

Grandmasters play with long-term strategies, creatively. They have ambition, a desire to win, a desire to achieve, a need for recognition. But computers play with tactics, calculating their next move based on the strongest mathematical gain possible. In fact, computers have absolutely nothing to gain from winning at chess.

Which makes them the most terrible of all opponents, and perhaps the most instructive. When a grandmaster plays a computer, chess becomes a battle between human thinking and machine thinking; and the results of that battle become a parable for what makes us



human, for what we might learn from machines, and for what machines, in a strange twist of silicon evolution, are learning from us.

At the IBM Watson Research Center in Yorktown Heights, New York, Feng-Hsuing Hsu, Murray Campbell, and Joseph Hoane developed Deep Blue's chess-specific hardware and software – not to achieve intelligence, but to achieve a long-standing goal of computer science: to measure machines against humans in chess.

"I don't consider what I'm doing as artificial intelligence," Hsu says. "I'm trying to solve an open computer-science problem by engineering the means, doing whatever is technologically possible, by just pushing the technology and seeing what happens. And that's interesting by itself. Whether it's important from an artificial intelligence point of view is of no concern to me."

The Deep Blue team wants to win by high-speed formulations of chess positions beyond

itively dismiss moves. But when Deep Blue mathematically searches to its ultimate horizon – seven moves deep per side, and much deeper at times – it will check out *every* move. And that's not fuzzy at all.

"In games against humans, you often win because the opponent blunders a piece, and you can often survive when you do it yourself," says grandmaster Vladimir Kramnik. "Against the computer, you make only one mistake – the last one."

Deep Blue will not necessarily see beyond the horizon of the best human mind; no one knows yet. But no matter how deeply Kasparov can strategize, Deep Blue may tactically, one move at a time, see through all of his strategies. Then again, its horizon may very well turn out to be deeper than even Kasparov's.

"Deeper. So what?" Kasparov responds to this possibility scornfully. Humanity's defender is the most deeply prepared, the most deeply studied player of chess. He constantly invents

"In games against humans, you often win because the opponent blunders a piece, and you can often survive when you do it yourself," says grandmaster Vladimir Kramnik. "Against the computer, you make only one mistake – the last one."

Kasparov's grasp of the game. Meanwhile, Kasparov will look for positions far more difficult to calculate than his tricks against Fritz3, chess strategies deeper – he hopes – than Deep Blue can see.

But it won't be easy. When grandmasters look for their next moves, they dismiss many possibilities in the average chess position. They may look deeply at five moves, or at as few as two; or without conscious thought, they may just know the right move – with intuition programmed by years of playing other humans. Grandmasters may dismiss ugly and weird moves a computer might play, moves that might win the game but would make no sense in the context of human decision making. Intuition is fuzzy.

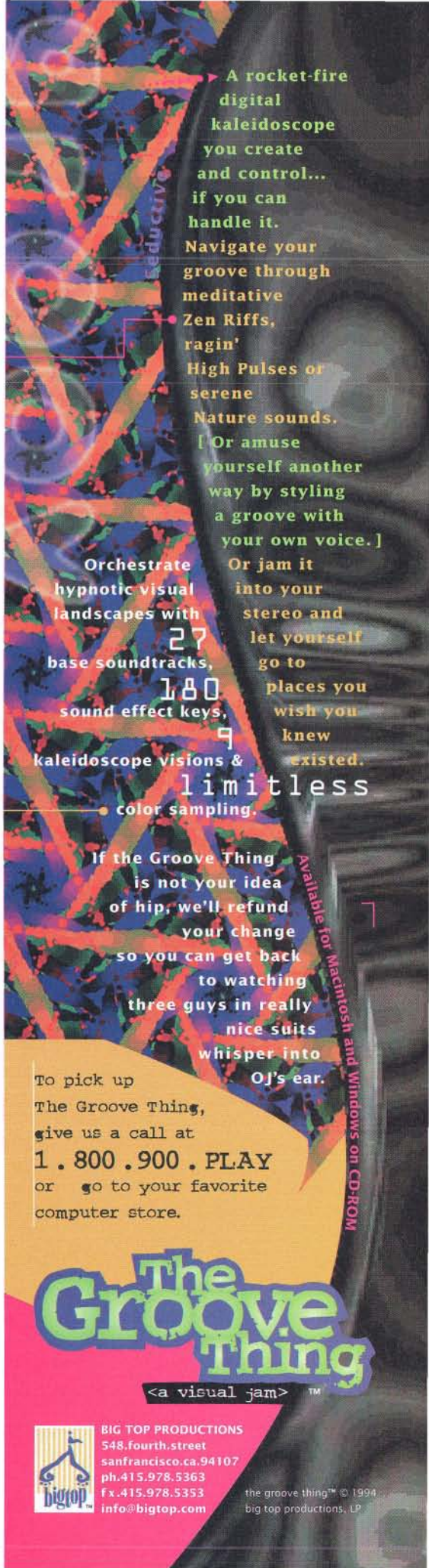
In the blitz game against Kasparov, Fritz3 kept attacking, unaware that Kasparov had made his first blunder. Kasparov wasn't beaten so much by Fritz3 as he was by himself. But Deep Blue – a more powerful machine – might have found the move Kasparov missed. It would have been within Deep Blue's horizon – the depth of future positions to which a computer can search. Even if Kasparov's intuition allows him to see deeper into a game than Deep Blue, he will always intu-

new, deeper, winning combinations of moves. As for Deep Blue playing its moves one at a time toward a winning position beyond his horizon, Kasparov sniffs his fingers and scoffs, "Horizon. So what? You'll feel it with intuition." *It*, in this case, is the trap Deep Blue will set for him. When Kasparov prepares to play Deep Blue by studying its games, he will look for flaws, for holes in its play, and he will devise his own traps.

Kasparov's confidence when he speaks of beating Deep Blue with intuition makes a listener want to believe him. But IBM's Campbell calls intuition "just a very powerful evaluation function. People play without knowing whether they are completely correct or not. Deep Blue won't play unless it thinks it *is* correct."

"You can make the computer know how to play chess because you can precisely define what chess is," says Hoane, Deep Blue's laid-back young programmer. Campbell, repeating a mantra of computerists, defines chess as "a disconnected series of problems to be solved."

Just as against Fritz3, Kasparov could think he is up in a game against Deep Blue, but finish down, materially, positionally, 170►



Chess Master

◂ 169 and psychologically, by blowing a single move. Kasparov may have what he thinks is a sound strategy, he might even think he sees what Deep Blue is doing, but while chess games have continuity from move to move for humans, there is no continuity for computers. A human's strategy is imagined, based partly on the opponent's reaction. But Deep Blue's reactions may simply be too deep – or too unpredictable – to imagine.

No matter how well a computer knows the game, even Deep Blue fails the Turing test of artificial intelligence – indistinguishable imitation of humans. When Deep Blue masquerades as an anonymous human on the Internet Chess Server (ICS) (telnet *chess.lm.com 5000* or finger *sleator@cs.cmu.edu*), experienced players feel the difference. Grandmaster Patrick Wolff likens a computer's chess-playing style to "a language with a different accent." And that accent emerges from a difference in thinking.

"Some of the positions they get are so *awful* that a human would just have mentally resigned several moves ago, but a computer can happily defend such a position," says Viswanathan Anand, one of the top five chess players in the world. "Defending a bad position is an art, but I shouldn't even talk about computers in this sense, because they're not even conscious that they're playing chess. It's just moving bytes, doing zeros and ones. It doesn't care. It doesn't matter how bad its positions are."

In other words, a computer is a dogged, foreign player, but a player nonetheless. We like to think of ourselves as unique in our ability to intuit, but recent brain scans by Dr. Jordan Grafman at the National Institutes of Health have shown that when humans puzzle over chess, no matter how complex the processes, that puzzling is a mechanical process.

"What we think happens is that the prefrontal cortex, in a sense, activates the appropriate configuration in a neural network in the back of the brain to evoke the image" of a series of moves, says Grafman. In other words, the player evokes a series of prestored moves, or memories, and compares them with other possible moves, also prestored. This is machine-like. "They're going back into their memories and trying to retrieve similar endgames and move strategies that they've used in the past."

Sound familiar?

Today, 99.9 percent of humanity cannot beat the best commercial software at blitz chess. Within the decade, it's likely the machine on your desk will know how to play chess better than any human has played the game since its invention in AD 600.

Kasparov does not think a computer that plays like the best human player will ever be possible, but he does not explain why he thinks so. He can only express his dismay at the idea: "Imagine a machine of that type. It means we not only abandon chess, but also music, literature. We're talking about universal advantages of the human being."

Kasparov may never be beaten by Deep Blue, because before he has a chance to face the computer, he may be beaten by one of a number of young human players, such as Anand, Gata Kamsky, or Vladimir Kramnik. And it is these contests, the challenges themselves, that are innately human. After all, what passion is there when two computers play each other? (Should you care to find out, the World Championship of Computer Chess will be played in Hong Kong this May.) Computers do not *want* to win in chess; they have no force of will. But for humans, the will to win, the fighting spirit, is mentalized and applied to an abstracted world called chess.

In New York, in June 1994, Kasparov sat across from Anand to defend himself. The two men played in a strangely silent room. Their actions – moving little pieces of wood – were displayed on huge video screens, while Maurice Ashley's blow-by-blow commentary – fed to earphones by infrared – kept the nearly 1,000 people in the audience on the edges of their seats.

It may be hard to believe, but the crowd reacted as if watching a boxing match. There was no blood visible as a dispassionate Anand beat Kasparov onto the ropes, but Kasparov's roiling angst surfaced as he raised his eyebrows and rolled his eyes at each of Anand's moves. Boxed in, the underdog champ remained motionless and let his clock run. For minute after minute, he sat thinking as the audience held its breath. When Kasparov finally made a cryptic move, the room gasped with relief.

Perhaps confused by the signals he was getting from Kasparov, Anand missed his next move. He blundered. Kasparov had psyched him out, and now the champ fought his way back from the ropes and trapped his challenger's king.

When Anand looked up from the board, his hand shot out not to make a move, but to shake Kasparov's hand. Anand had resigned, and the room exploded in applause.

Kasparov still has a shot at defending humanity against the Silicon Monsters. ■ ■ ■

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■ *Chess Genius 3.0* **by Richard Lang beat Gary Kasparov at action chess. Other top-notch chess software worth checking out are *WChess*, *Rebel 6.0*, and *M-Chess Pro 4.0*. All available from Institutional Computer Development, $149.95 each. Kaufman ranks *Chessmaster 4000*, which runs on Windows, among his top 10 packages. Available for $59.95 from Mindscape, +1 (415) 883 3000.**

■ **Want to interact with the master himself? Kasparov will give you comments from a small video window within *Kasparov's Gambit*, a pleasing interface to the world of chess. Available from Electronic Arts, +1 (415) 517 7171.**

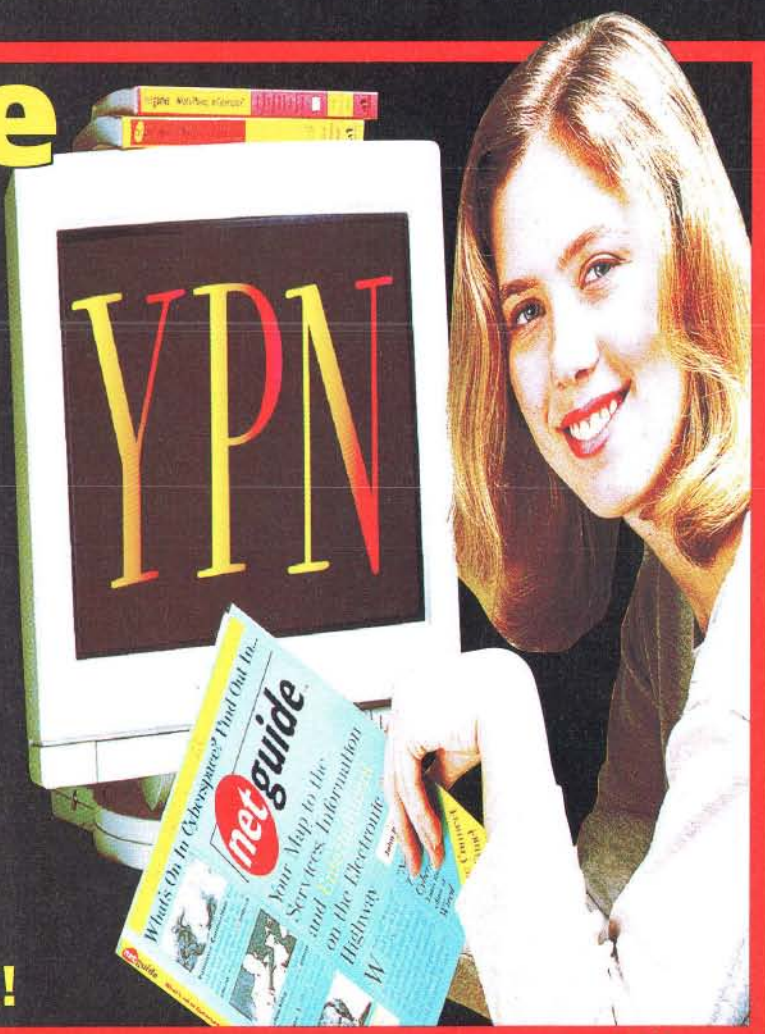
■ *Fritz3* **beat Kasparov in one out of five games at blitz chess, and is available for $125 from ChessBase USA. ChessBase owns a professional database of 215,000 grandmaster games that sells for $295. ChessBase USA: (800) 524 3527, +1 (301) 733 7541.**

■ **On the Net, the chess FAQ is great source of information on software, organizations, trivia, and servers. Find it via anonymous ftp from *rtfm.mit.edu* under */pub/usenet/news.answers/games/chess*. Or, send e-mail to *mail-server@rtfm.mit.edu* with "send usenet/news.answers/games/chess /part1" (and also part2) in the body of the message, leaving the subject line empty.**

■ **Net cruisers can rap with other chess players in the Usenet group *rec.games.chess*. Move lists from championship games are often posted here within hours of the game's completion. Download the lists, import them into chess software, then play them, analyze them, and take notes.**

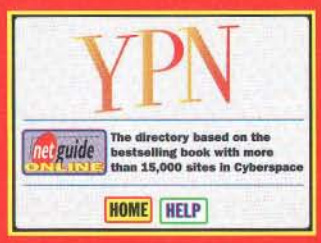
■ **Many online services sport chess areas, but on the Net, telnet to *chess.lm.com 5000* (or finger *sleator@cs.cmu.edu*). There you can play chess with humans. Or with machines who may just be pretending to think like you and I. – *Jeffrey Goldsmith***

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◄ 133 through the French courts, for instance, the suit against *Naissance d'un Virus* was finally thrown out by a tribunal arguing, as Ludwig proudly reports, that "trying this case was like putting Galileo on trial again."

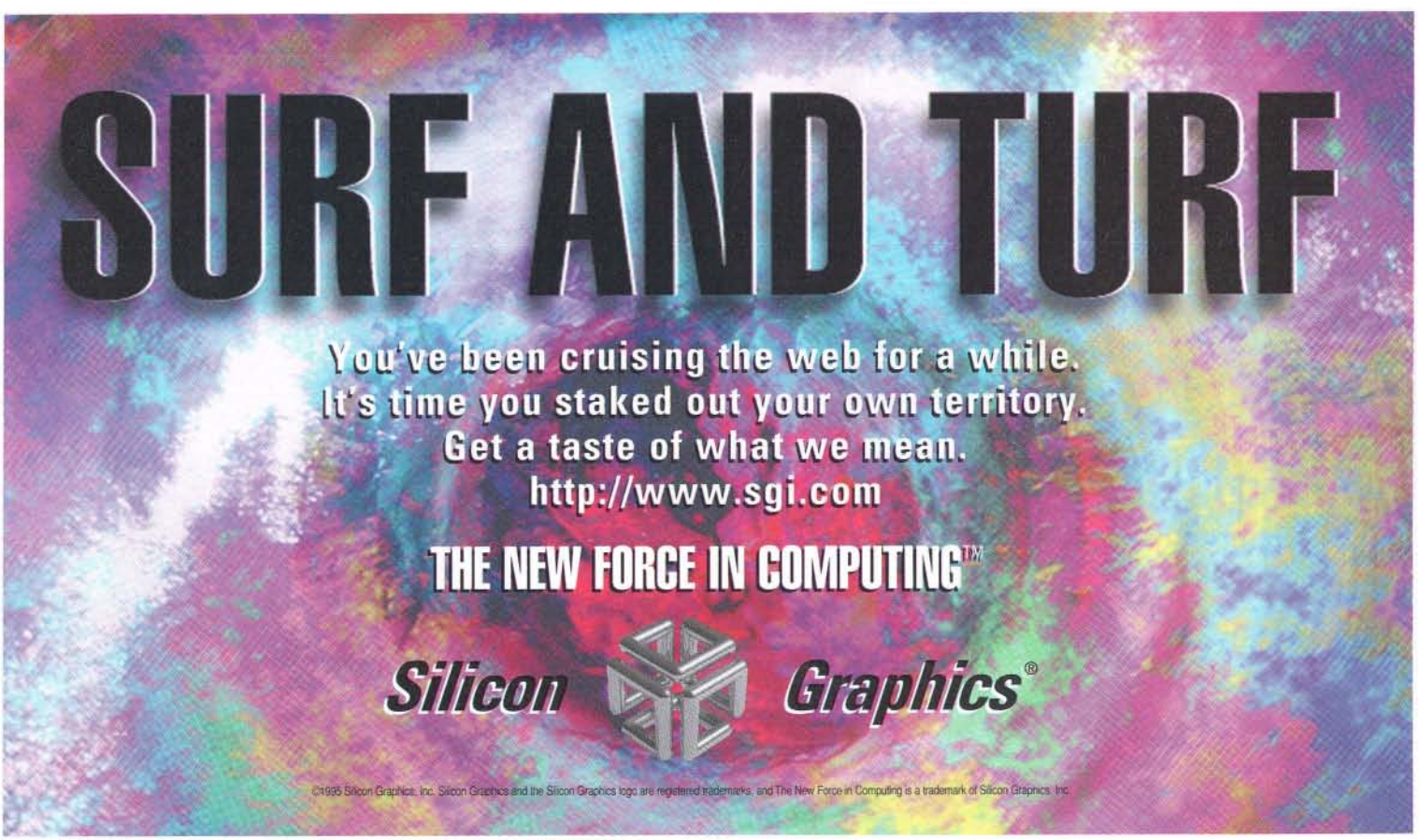
tioned *Computer Viruses, Artificial Life, and Evolution*. Published late in 1993, the book is a dense and daunting 373 pages' worth of charts, differential equations, and tightly reasoned arguments in support of Ludwig's intuition that self-reproducing computer code bears deep lessons about the workings of life.

Feral viral ecologies (versus the controlled experiments in university labs) represent the only known simulation of life that does not implicitly build God into the system.

Yet amid all of Ludwig's busy agitation in defense of viruses, what ever became of the intellectual mysteries that first drew his attention to them? His pleasure at being compared to Galileo, the archetype of the politically incorrect scientist, certainly suggests that he never lost his sense of scientific mission. But the proof of Ludwig's abiding interest in viruses as tools of natural philosophy lies in his sequel to *The Little Black Book*: the aforemen-

As the title's nod to the fashionable new scientific discipline of artificial life makes plain, however, Ludwig is clearly aware that other researchers, backed by the imprimatur of Official Science, have been building on the very same intuition for some time now. The first two volumes of the Santa Fe Institute's *Proceedings on Artificial Life* published in 1989 and 1992 devote several papers to the idea of computer viruses as synthetic life. But taking the idea further, Ludwig argues that computer viruses, unlike such other forms of artificial life as cellular automata, mobots, or genetic programming, are the only form of artificial life not biased by the hope of their creators. Because computer viruses must exist in an environment (DOS in particular) that was designed without any thought of the digital organisms that might come to inhabit it, they are free from any accusation that the environment's "physics" were written to support the emergence of their lifelike behavior. Or to put it more bluntly, feral viral ecologies (versus the controlled experiments in university labs) represent the only known simulation of life that does not implicitly (and quite unscientifically) build God into the system.

Having carefully constructed this ambitious claim, Ludwig proceeds to test drive it straight into the heart of biology's most vexing questions: How did life get here in the first place? How did the staggering diversity of life forms that exists today come to be? He sics viruses on the theory of evolution itself, in other words, sending them in to illuminate with their logical simplicity the still murky depths of Darwin's grand hypothesis. It's a bold move, but a puzzling one at first glance. Although the viruses found in the wild may exhibit a wide range of lifelike features, they've never



been known, after all, to *evolve*.

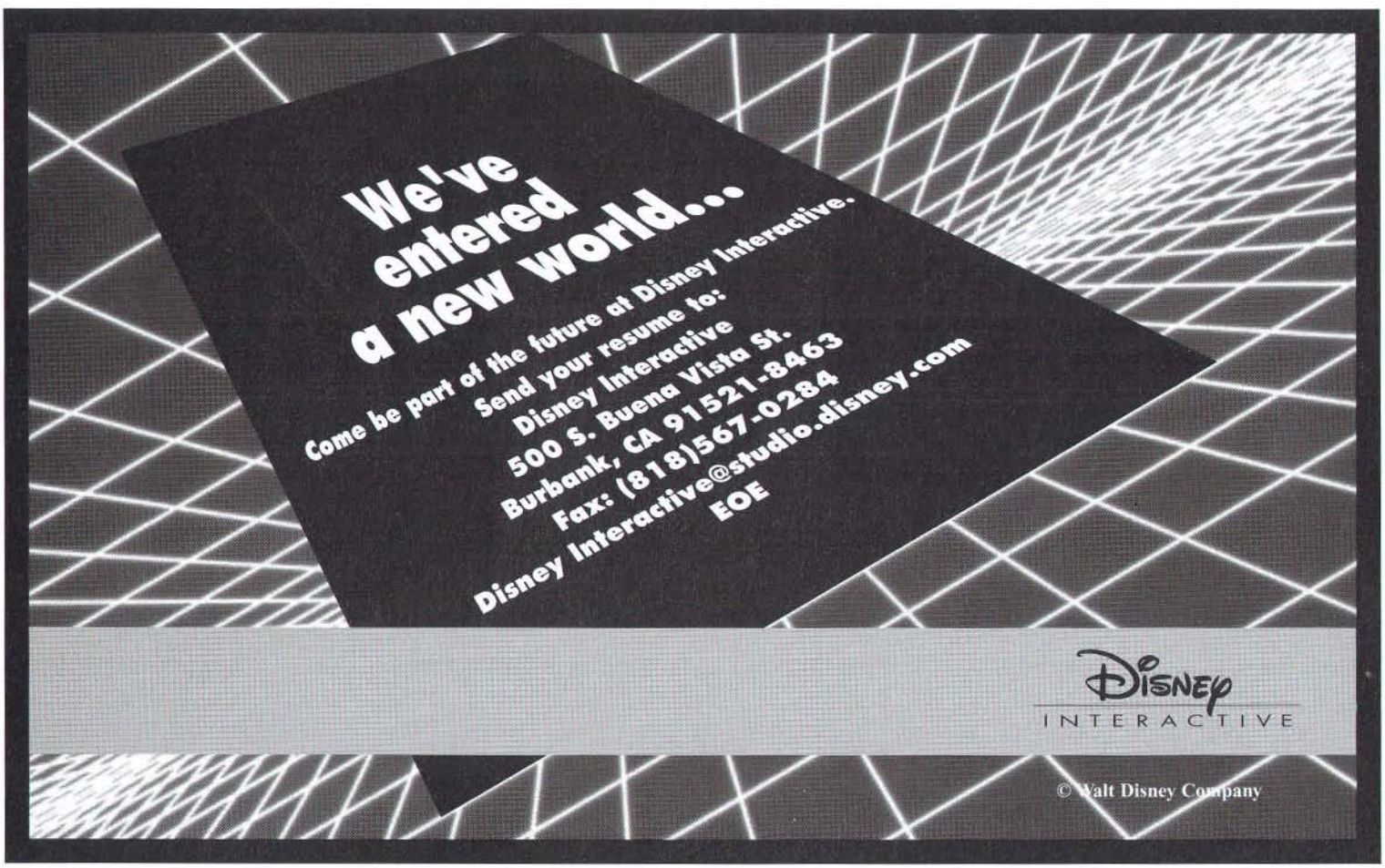
Or have they? Not too long after the first virus was written, the first antivirus program was written as a countermeasure. Once antivirus software was introduced into the cybernetic ecology, viruses and the programs that stalk them have been driving each other to increasing levels of sophistication. This is nothing less than the common coevolutionary arms race that arises between predators and prey in organic ecosystems.

Step one in this quasi-Darwinian dance took place when security-minded programmers developed what has since become the standard defense against viruses for most PC owners – scanning software that looks for telltale code fragments of known viruses (often some scrap of graffiti-esque text) and alerts the user when it finds any. In time, virus hackers responded by wrapping their programs in a blanket of encryption impenetrable to scanners. But since the built-in subroutines that decrypt the programs for execution cannot themselves be enciphered, antivirus programmers simply retooled their scanners to look for the decryption code. Later, in step two, the legendary Bulgarian writer Dark Avenger came up with a clever innovation known as a mutating, or polymorphic, virus. A mutating virus randomly reorganizes its decryption algorithm every time it replicates to outsmart the policing of the scanner. In step three, antivirus engineers devised "heuristic" scanners, built to sniff out all but an insignificant percentage of a virus' mutants through educated pattern recognition.

Surveying the fossil record of this game, Ludwig found himself pondering a logical next move: what if someone were now to develop a strain of polymorphs with a genetic memory, so that rather than completely reshuffling their structure with every generation, the few mutants that escape discovery by heuristics could pass their undetectable code on to their offspring?

The prospect of virus populations able to autonomously build up immunity to any scanning techniques thrown at them thoroughly depressed antivirus programmers. To Ludwig, however, the possibility proved too intriguing to wait around for some random underground hacker to realize it, and he resolved to do the job himself. The result: Ludwig's "Darwinian Genetic Mutation Engine," a programming utility that turns any normal DOS virus into a souped-up, genetically evolving polymorph, complete with an option for sexual gene-swapping between individuals that come into contact in the wild. Curious hackers can find the Darwinian Genetic Mutation Engine's complete source code in the pages of *Computer Viruses, Artificial Life, and Evolution*, along with detailed experimental results demonstrating the ability of Darwinian Genetic Mutation Engine-enhanced viruses to run rings around existing scanners. But the program's deeper significance, of course, lies in its potential to transform viruses' heretofore hacker-driven pseudo-evolution into something very like the real thing: a finely tuned interaction of variety and natural selection that allows the environment itself to shape the internal code of the organisms dwelling in it.

The Darwinian Genetic Mutation Engine is all Ludwig needs, in other words, to prove viruses capable of meaningful evolution, and incidentally, test Darwin's theory. And it's no surprise perhaps, given Ludwig's hard-earned distrust of anything smacking of intellectual orthodoxy, that he has found that Darwin's venerable theory fails the test. Running his beloved viruses through assorted experimental hoops and mazes, Ludwig followed them to the conclusion that Darwinian evolutionary mechanisms alone are just not mathematically fertile enough to have created and shaped life as we know it. This is a well-worn scientific heresy, of course, but it's not without its small but respectable following within the ivory 175 ►



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Viruses

◄ 173 walls Ludwig so proudly dismisses.

To be fair, though, Ludwig is not asking to be ranked among his boyhood heroes – those scientific greats whose unique insights clear broad new vistas of understanding in a single bound. All he wants from the rest of the world is a modicum of respect for the wild computer virus as a legitimate subject of scientific investigation. Or at least acknowledgment that this enduringly lifelike wonder could be useful if we but understood it, rather than the casting of it as the ultimate technological taboo.

Ludwig managed a remarkable intellectual shift. He elevated the computer virus from the digital equivalent of a can of spray paint to an object capable of perhaps infinite variations and almost lifelike behavior. He transformed a tool of vandals into a field of scientific study by emphasizing a computer virus' biological affinity. But by the time Ludwig began publishing, the computer virus was already well on its way from the fringes of science to the seat of honor at research symposiums.

Booting up the Cambrian explosion

"I'll be out at my place in the jungle over the weekend," said the message, posted in May 1994 from an obscure Internet site in Central America, "so I'll be out of e-mail contact till Monday."

And just like that, University of Delaware ecologist Tom Ray (now visiting scholar at the Advanced Telecommunications Research Institute International in Kyoto, Japan) disappeared once more into the rain forests of Costa Rica, leaving behind the clean conveniences of the digital world for an organic riot of plant and animal life. As promised, though, he would be back. Ray's passion for the unkempt splendor of the jungle has remained unabated after nearly two decades of intermittent research there, but in the last few years, it's the digital world that has claimed his closest attentions. Since late 1989, Ray has done his most important fieldwork seated in front of a computer, observing the busy fruits of an activity that has come to define his career: he breeds viruses.

Or to put it more precisely, he breeds worms, since that's the stickler's term for software that is both self-reproducing and able to execute its code independent of any host program. Ray, convinced that his programs are as good as alive, calls them simply "organisms," or "creatures." Whatever they are, though, he's been breeding quite a lot of them. He's been breeding them with the full support of his university employers, with the financial backing of major corporations, and with the steadily growing curiosity and respect of fellow researchers in the fields of both biology and computer science. And 176 ►

Ray's been breeding viruses, digital organisms, or whatever you want to call them, with the full support of his university employers and with the financial backing of major corporations.

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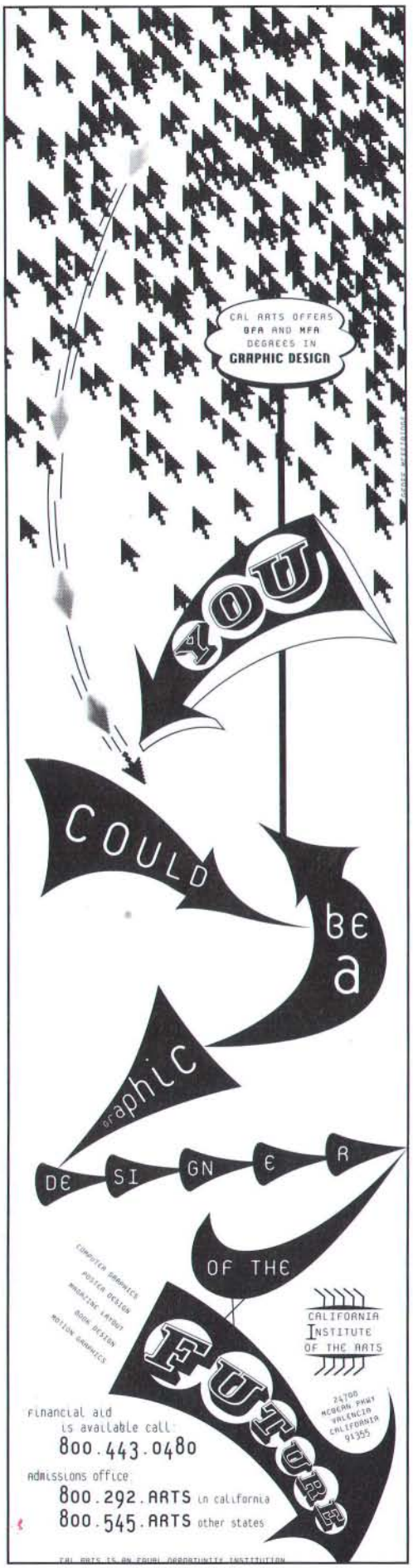
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Viruses

◄ 175 if all goes according to plan, he will keep on breeding them until he has achieved a goal far more adventurous than anything yet attempted by other virus programmers – infusing the vast unused spaces of the global computer networks with a roiling digital ecology as complex, as fascinating, and ultimately as beneficial to humankind as the rain forests that he has long sought to protect and understand.

In short, by infecting the Net with self-replicating code, Ray aims to turn it into a jungle.

He didn't start out so ambitious. In the beginning there was just a lone drive of a Toshiba laptop to populate, one tiny digital germ to do it with, and a hunch Ray had been kicking around for a decade or so to spur him on. The hunch was that experiments with self-replicating programs (Ray had first heard about them as a Harvard undergrad in the late '70s) might add some theoretical rigor to eco-science's essentially anecdotal attempts at explaining the abstract processes that gave rise to the complex interspecies relationships he had observed in the field. "I was frustrated," he would later tell a group of colleagues, "because I didn't want to study the products of evolution – vines and ants and butterflies. I wanted to study evolution itself."

Now that Ray was working with an imaginary computer, he was free to shape the system's design to create an environment that was much more hospitable to life.

In this, Ray's attraction to self-reproducing programs differed little from that of Mark Ludwig (who in fact was not unfamiliar with Ray's work by the time he set out to write his magnum opus on computer viruses and evolution). Unlike Ludwig, however, Ray felt neither philosophically obliged nor ethically disposed to work with viruses able to thrive in already existing computer environments. Not that he never considered the option. In fact, his initial plan was to set mutating machine-language organisms loose in a single computer and watch their evolution as they competed against one another for direct access to the computer's core memory, a strategy that might have evolved viruses superbly adapted to any system based on the same instruction set as the original petri chip. But Ray soon scrapped this idea – the risk of accidentally releasing his specimens into the wild seemed too great. Instead, he decided, he would evolve his organisms inside a virtual computer, modeled inside a real one in much the same way some operating systems today can model working emulations of other OSes, allowing DOS programs (for instance) to run in Macintosh environments. The difference, in Ray's scheme, was that his simulated system would be the only environment of its kind; thus, any program that escaped into other computers would find itself a fish out of water, unable to function anywhere but in its birthplace.

While the security benefits of this approach were obvious, its contribution to the scientific effectiveness of the experiment was even more significant: now that Ray was working with an imaginary computer, he was free to shape the system's design to create an environment more hospitable to life. And there was one key change to be made in that regard, for as Ray had come to recognize (and Ludwig would later set down in hard math), today's digital environments simply weren't built with mutant programs in mind. Typical operating systems might let a program randomly move some of its algorithms around with impunity (as the polymorphic viruses do), but at the fine-grained level of individual bit-flipping most closely analogous to genetic variation, even a single chance alteration almost always results in a system-crashing bug. Nature's tolerance of random code revisions is much greater, and if Ray wanted a more "natural" computer, then one way to get there would be to give it an instruction set in which nearly any sequence of bits would make some kind of sense to the system's virtual CPU.

So he gave it that instruction. He also equipped his phantom computer with a death function, a "Reaper," which would terminate any individual program sooner or later – but would always get to the oldest or most error-prone programs first. Thus primed to carry out

the requisite natural selections, Ray's digital ecosphere was nearly complete. He called it Tierra (Spanish for "earth") and started preparing the final touch: an inhabitant. Later dubbed "the Ancestor," it was the first worm Tom Ray ever created – an 80-byte-long self-replicating machine written in Tierra's quirky assembly language – and as it happens, it was also the last. Once loosed into the Tierra environment installed on Ray's laptop, the creature's offspring quickly spread to the new world's every corner, within minutes displaying the evolutionary transformations that would "write" Ray's organisms from then on.

A 79-byte variation appeared, rapidly displacing its slightly clunkier predecessors, then smaller descendants followed – a 45-byter, a 51, eventually even a 22 – entering a taxonomy that would grow to accommodate hundreds of subspecies as Ray played with Tierra in the months and years to follow. The swift and drastic size reductions of those first runs startled Ray, but even more remarkable were the survival strategies these variants encoded. The 45- and 51-byte creatures, it turned out, were not worms but bona fide parasitic viruses, achieving their leanness by borrowing reproductive code from larger programs when they needed to copy themselves. In turn, host programs acquired an immunity from parasites by failing to register their location in the virtual computer's memory, thus foiling the parasites' attempts to find them.

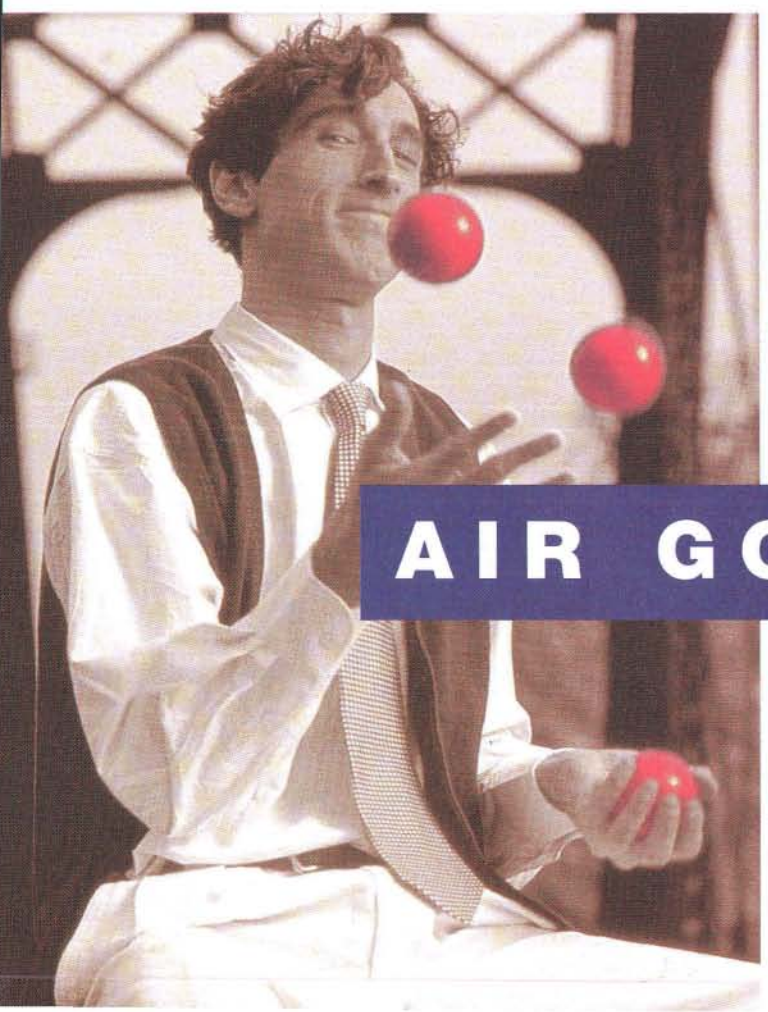
To the casual student of computer viruses, it's interesting to observe that despite the wide-open and neutral terrain into which the first Tierrans were placed, they swiftly and spontaneously adopted the same techniques built into wild viruses to ensure survival in an environment thick with hostile users and their software: parasitism and stealth. But to the serious scholars of biology who soon began to take note of Ray's work, such developments were more than just interesting. Out of the barest simulation of environmental forces, some of life's more sophisticated interrelationships were emerging entirely unbidden, and while the Mark Ludwigs of the world might object that Ray's initial fine-tuning of Tierran "physics" tainted the experiment, Ray was more than satisfied with its scientific implications. Here, in the unexpectedly colorful diversity bred from a single simple program, was a compelling model of evolution's creative power.

"In my wildest dreams, that was what I wanted," Ray later told author Steven Levy. "I didn't write the Ancestor with the idea that it was going to produce all this."

As much as this bustling ecology-in-a-box thrilled and surprised Ray, however, it soon began to dawn on him that the Ancestor had produced something even more unexpected: high-quality software. Almost all of the Ancestor's progeny displayed some improvement in the efficiency of their code, but in a few cases, evolution seemed to have attained a level of tight-wound optimization difficult for even the most wizardly of human software engineers to achieve, and Ray couldn't help wondering if there was a way to yoke this inhuman skill to the development of practical applications.

It wasn't an unheard-of notion. As long ago as the early '60s, for instance, cutting-edge programmers had begun experimenting with what they called "genetic algorithms" – pools of software subroutines repeatedly multiplied, mutated, and weeded according to how well they performed a given task.

Two decades later, in the same groundbreaking work that established the ability of digital viruses to penetrate nearly any system defenses, computer scientist Fred Cohen also proved that viruses are potentially useful as all-purpose computing devices. As Cohen later put it, "anything a Turing machine can compute, a virus can evolve." Since then, Cohen has tested the proposition that 178 ▶



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Viruses

◄177 viruses can create useful code in a number of applications. One notable experiment of his is a network-maintenance ecosystem in which survival of the most needed cleanup tasks ensures maximum efficiency – in which, for instance, self-replicating programs designed to delete unwanted files randomly mutate their file-chasing strategies, with those strategies least wasteful of system resources being spared the Reaper's blade.

But the benefits realized in these experiments were limited, as Ray saw it, by their dependence on artificial rather than natural selection – that is, the software was allowed to evolve only in the direction of a particular function chosen by the programmer. In Tierra, on the other hand, organisms evolved according to criteria that they themselves created collectively, constrained only by the "natural" imperative to reward the thriftiest use of existing resources. Tierra gave evolution a free hand, in other words, and Ray felt certain that the creativity thus unleashed had the potential to tackle software-writing challenges far beyond the reach of human programmers. In particular, the difficulties involved in writing the most productive code for the parallel-processing machines that will take us into of the next century of computing seem to cry out for an evolutionary approach. "We will probably never be able to write such software, as it is way too complex," Ray observes. "Yet we know that evolution can handle that kind of problem."

The reason we know that, of course, is that we – and all other multicellular organisms – are wetware embodiments of frightfully complex parallel processes. But that fact posed a new challenge for Ray. Despite the great variety of digital forms Tierra had generated, it remained an ecology of one-celled organisms, none much larger or much more complicated than the 80-byte Ancestor. In fairness it should be pointed out that the terrestrial biosphere spent its first 3 billion years or so in a similar state before finally exploding into multicellular diversity at the dawn of the Cambrian era (a mere 600 million years ago). Yet if Tierra was ever to prove its full value as a software-writing machine – or indeed as a scientific model of evolution – sooner or later it would have to cough up a Cambrian explosion of its own. And since the key to this burst of complexity seemed to Ray to lie in challenging his evolving creatures with more intricate problems than the simple bit-copying tasks they'd grappled with thus far, he decided that the explosion wouldn't happen nearly soon enough if Tierra remained stuck inside conventional computers, and he began looking into the possibility of installing Tierra on a parallel-processing system.

"We will probably never be able to write software for parallel-processing machines, as it is way too complex," Ray observes. "Yet we know evolution can handle that kind of problem."

But then one day in early 1994, Ray had a minor epiphany: "I realized that the global network is just a loosely connected parallel computer, and much larger and more powerful than anything that will ever exist as a single machine."

And thus was born Ray's plan to colonize the Net. He wrote it up soon thereafter in a document plain-spokenly entitled "A Proposal To Create a Network-Wide Biodiversity Reserve for Digital Organisms" (See *Wired* 2.08, page 33), the text of which outlines a vast collective enterprise devoted to hastening the arrival of the digital Cambrian. Ray envisions a Tierran subnetwork spread across thousands of volunteer Net nodes, each of them running the environment as a low-priority background process sustained only by unused (and otherwise wasted) CPU cycles. He is confident that once his "one-celled" simple self-replicating organisms encounter the immensity, the topological intricacy, and the fluid instability of the Net, they will quickly rise to the occasion and evolve into tightly coordinated multicellular conglomerates, thus setting off the dreamed-of Big Bang of complex digi-biotic diversity.

Ray foresees digital naturalists like "modern day tropical biologists exploring our organic jungles. However, occasionally these digital biologists will spot an interesting information process for which they see an application. At

this point, some individuals will be captured and brought into laboratories for closer study, and farms for breeding." Harvested, domesticated and then neutered of their self-replicating properties, these prize specimens of code could then be translated from Tierran language into standard programming languages and set to work at any number of tasks. Ray suspects some form of intelligent network agents would be the likeliest first applications to be culled, but he prefers to emphasize that the most useful products of the digital jungle would be as difficult to predict as rice, pigs, penicillin, and silkworms might have been for an observer of the pre-Cambrian ooze of early carbon-based life.

There's a whiff of science fiction rising from all this, of course, but Ray is hardly indulging in idle speculation. Already a team of computer scientists has gathered under his supervision to work full-time on hammering out the technical details of the plan. He's accustomed by now to dealing with his listeners' occasional anxieties about the prospect of Tierran viral-like pests infiltrating the workaday network environment. "I explain why the things can't escape," he says, "and that quiets the nervous people, but some of them continue to *look* nervous."

But when the time comes to put their systems where their mouths are, how many site administrators will do so? Not enough, fears Danny Hillis, founder and chief scientist of Thinking Machines Corporation, the former manufacturer of massively parallel computers that had been supporting Ray's work. For all the tricky engineering involved in running Tierra on a Netwide scale, Hillis believes, the greatest challenge facing Ray "turns out to be more of a political issue than a technical issue. People are not necessarily going to want to give up their processing cycles for this" – even if those cycles will otherwise rot on the vine – simply because of a deep-seated reluctance to cede so much as a fragment of administrative control over system resources to a program whose internal processes serve no immediate ends but their own.

But even if computer users ultimately reject the deliberate presence of a global wilderness reserve for computer viruses woven neatly into the fabric of the Net, they may yet fail to keep the computer landscape from turning to jungle. After all, the same personal and subcultural imperatives that drove Hellraiser's career will continue to inspire underground virus writers. And the digital terrain continues to get more interesting. If the Darwinian innovations introduced by Mark Ludwig are any indication of coming trends in viral technique, then it's not inconceivable that a vital ecology might someday flourish in the midst of our daily routines, unplanned, uncontained, ill-comprehended, and irrepressible. It's an unnerving prospect. Yet it wouldn't have to be – not if we prepared for it by actively cultivating a digital biodiversity of the sort Tom Ray proposes. This is a niche that will be filled, whether we fill it deliberately or not.

"We're just going to have to live with them," artificial life researcher Chris Langton says of computer viruses. Our global web of digital systems, he predicts, is fast unfolding towards a degree of complexity rich enough to support a staggering diversity of autonomously evolving programs.

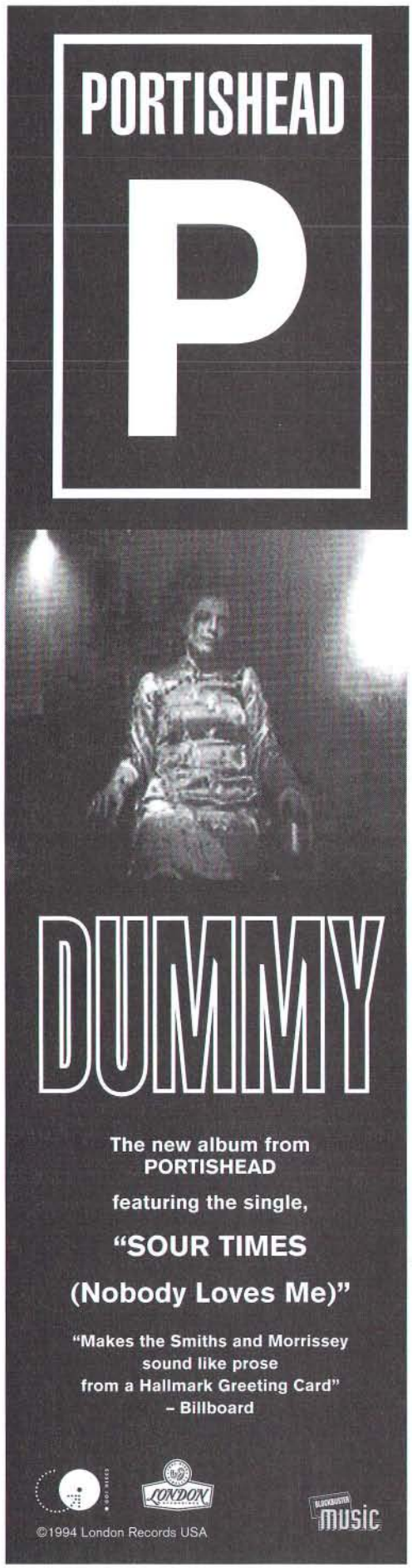
Viruses in a suit and tie

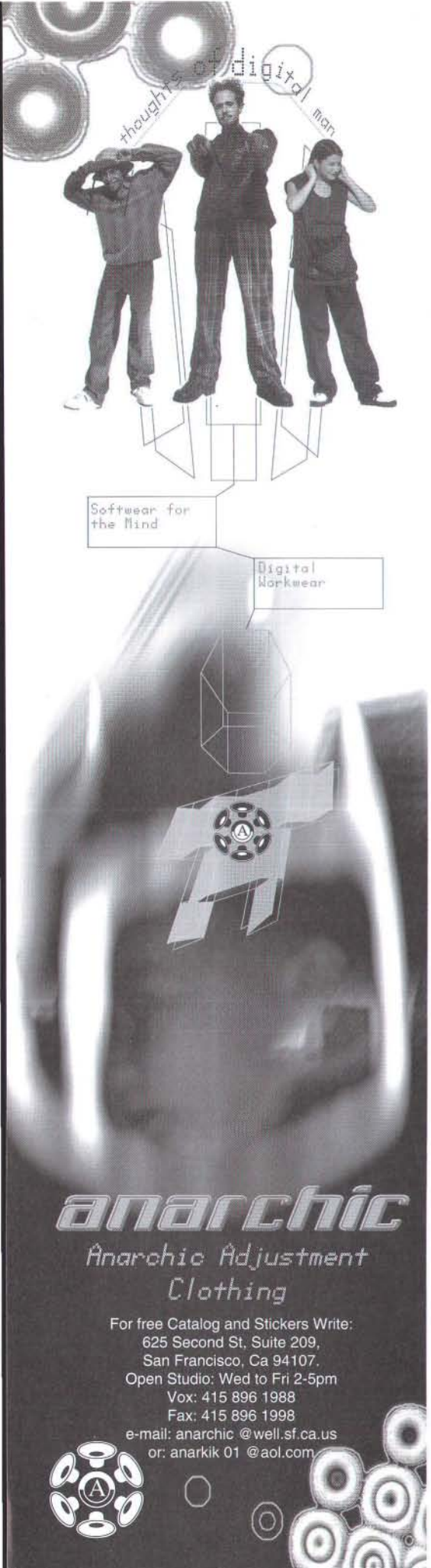
But the future of beneficial viruses is not only in the hands of eccentrics such as Hellraiser, Ludwig, or Ray. The good folks at General Magic corporation are eager to put viral code on a firmer and decidedly more lucrative footing. Not that they like to hear it said that they have anything to do with viruses, mind you.

General Magic manufactures a hand-held communication device that relies on a nifty new network-streamlining program language called Telescript. Announced earlier this year with the very visible backing of such info-dollar heavyweights as AT&T, Apple, Sony, and Matsushita, Telescript proposes to do good things. Its intelligent agents, General Magic co-founder Bill Atkinson promises, will soon be flitting about cyberspace on your behalf, visiting remote commercial sites to buy, sell, and trade information for you, and generally behaving themselves with all the decorum you'd expect from a personal digital valet.

Still, despite rather severe restrictions on the agents' ability to replicate, it's hard to deny certain broad similarities between intelligent agents and the offerings of your typical Vx board. Both wild viruses and Telescript agents routinely copy themselves from one computer to another. Both viruses and Telescript agents can run themselves on the computers they travel to, and, for those same reasons, raise differing degrees of concern about their security. "A virus never does anything good *for* you, it only does things *to* you," says hacker legend Bill Atkinson, nervously reaching for a fine semantic distinction between computer wildlife and Telescript's semi-autonomous "intelligent agent" programs.

More intriguing, though, are Telescript's close similarities with Tom Ray's digital diversity reserve and the experiments of Fred Cohen. Cohen, now happily self-exiled from academia and in business for himself as a computer-security guru, is experimenting with a distributed database in which self- 180 ►





Viruses

◄ 179 reproducing query agents scurry throughout a network, much like the Telescript scheme. And like the sprawling biosphere of global Tierra, Telescript's bustling marketplace depends on a broad base of local interpreter programs installed wherever its agents go to do their business. This has two significant implications. For one thing, the fact that the mobile organisms of both Telescript and Tierra interact only with their interpreters, incapable of functioning in their absence or of bypassing them to directly affect the host environment, obviates many of the security concerns surrounding their autonomy. (Telescript, additionally, makes use of a battery of cryptographically secured restrictions to ensure that its agents don't subvert control of the host machine, either by accident or by malicious design).

And for another thing, the fact that all the interpreters speak the same programming language regardless of the underlying operating system and hardware means that, as the base of interpreters approaches omnipresence on the world's computer networks, the Net approaches the condition of a single, vast, and unmappable supercomputer, with each wandering digital organism a process in one worldwide parallel computation.

Taken together, these two features represent something of a watershed in the history of computing. It has long been observed, rather wistfully, that in principle the world's computers sum up to one gigantic parallel processor, and that the crushing bulk of that metacomputer's CPU cycles goes to waste, unused. Only now, however, with the advent of protocols like Telescript and Tierra, do we have the means to deploy such processes that treat the Net as one machine, safely and sensibly. This, then, is the real significance of these endeavors.

The world's computers sum up to one parallel processor. Now, with the advent of protocols like Telescript and Tierra, we have the means to treat the Net as one machine, safely and sensibly.

The dark side of benefits

Trying to imagine the marvels that pour forth once you've successfully tapped a computer as elaborate as the Net is as futile as trying to map the future of a society, or of a life – or of life itself.

Of course, trying to foresee the risks that could emerge from that same computer is an equally hopeless task. But as it happens, we are bound to face those risks whether or not we seek to harness the full power of the Net, since the teeming and inevitable population of uncaged digital organisms will in any case plow forward with its own relentless exploration of the Net's capabilities. All we would miss by failing to orchestrate a more manageable viral exploration of our own, therefore, would be the potential benefits – including quite possibly some antidotes to the worst depredations visited on us by the viruses of the wild. And including also, perhaps, something even more precious. For if there is any purpose legible at all in the millennia of human history, it is in the unflagging persistence with which we add to the complexity of the universe. So, if we were to shrink from the chance to actively participate in transforming the Net into the single most complex information entity since the emergence of the human brain, would we not then be shirking a duty of almost cosmic proportions?

It could happen. It's hard to say which is really the more characteristically human trait – our drive toward complexity or our sometimes irrational fear of it. In the matter of computer viruses, fear could well gain the upper hand. It has already shown itself, after all, in our human tendency to overly reduce the multifaceted motivations of the virus writer to a caricature of hooliganism. Likewise it seems to lurk behind the urge to deny that viruses can be anything but lethally dangerous. But we'd better think long and hard before we let it stand between us and the epic opportunities that globally distributed viral programming presents us with. Because in the end, the meaning of our long-term coexistence with computer viruses may prove difficult to distinguish from the meaning of our own existence. ■ ■ ■

Colophon

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Drugs of choice: Sierra Nevada Celebration Ale, Cilantro, stolen Odwalla, *Melrose Place*.

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Plunderphonics

◂141 talking. It's sort of like an idiot savant kind of thing: I don't know what I'm doing, but I can do it." Once a week he gets together with some friends in a basement to play entirely "improvised chamber music."

Do they ever record it? "No! Improvising is my hobby! I don't want to get my job involved in that!" His playing has been recorded, however: there's *Improvised*, a 1978 duo album with Henry Kaiser; *Moose and Salmon*, featuring Oswald and Kaiser with trumpeter Toshinori Kondo; and a cut of the 1994 CD by Canada's Hemispheres orchestra that features Oswald blowing his sax.

Oswald earns his living making more mundane music – until recently, most of it was "canned music for stage situations." Since the mid-'70s, he has created a number of tape pieces for dance (many of which have been collected on *Discosphere*, released by Cuneiform Records in 1991). He's also created a few television soundtracks, and in 1994, he did his first musical score for an animated cartoon.

Oswald's compositional method is diametrically opposed to real-time improvisation. "It's very rare for me to perform to tape, to do something in real time that's going to give me a real-time result. The editing together of material takes time. If you want to get a five-minute piece together, you might spend hours and hours doing that.

"That's exactly what happens with a painter. They might be trying to represent something that has some sort of sense of realism for somebody, but the process of getting to that point takes a lot of time. So I work, in that sense, more like a painter."

This artist doesn't just work in the audio realm. His favorite creation is *Pitch*, which he designed with Emile Morin. "It's a giant sensory deprivation tank for a perambulatory rather than reposed cerebranaut," he says. *Pitch* was erected in Quebec City in 1992 at Obscure, an arts and media facility that has since mutated into Medusa, a multimillion-dollar communications center. "They asked me to create a sound sculpture, but being a contrary sort of guy, I built something that didn't make any noise at all," Oswald says.

Having produced several works with the blessings of his sources, John Oswald seems to have escaped characterization as a copyright maverick and moved along his career as an innovative composer. He will continue to tweak the blue noses of intellectual-property reactionaries, but he'd rather make music than legal precedents.

When I asked how he would like to see the copyright laws adjusted to account for plunderphonics, he faxed me this reply: "As you know I'm not, nor do I desire to be, a lawyer. I think my job is to try to make things that are interesting and desirable enough that the mechanisms of their availability will be generally, eventually considered necessary.

"Or, to quote my Toy Weathercaster, Rick Sacks, 'I does art … art am fine.'" ■ ■ ■

D I S C O G R A P H Y

A selection of currently available digital audio discs by John Oswald:

Tape copies of *Plunderphonic* (72 minutes) and the *Rubiyat Plunderphonic* (elektrax; 15 minutes) are both underground recordings not to be found through "legitimate channels." Copies are available at cost (with a self-addressed mailer and C-100 cassette tape) from: Copyright Violation Squad, c/o The Drawing Legion, PO Box 227, Iowa City, Iowa 52244.

***Gray Folded* Volume 1: "Transitive Axis" (60 minutes), containing music by the Grateful Dead 1968-1993, is available from: Swell/Artifact for C$19.69: (800) 263 4020, specify catalog item S/A 1969.**

***Discosphere* (74 minutes) is available in stores or for £14 from: ReR MegaCorp, 74 Tulse Hill, London SW22PT, England. Catalog item JOCD.**

***Plexure* (released in 1993 on Avant by DIW Japan; 20 minutes) should be available in stores; if not, tell them to order it.**

***Musicworks* magazine, issue number 60, contains a long critique on the plunderphonics genre, accompanied by a CD or cassette with several plunderphonic examples not found elsewhere. C$5 print, $8 cassette, $10 CD. Musicworks, 179 Richmond Steet W., Toronto M5V IV3, Ontario, Canada: +1 (416) 977 3546, fax +1 (416) 204 1084.**

Message 20:
Date: 2.1.94
From: Nicholas Negroponte
<nicholas@media.mit.edu>
To: Louis Rossetto <lr@wired.com>
Subject:

Being Digital – A book (p)review

The Paradox of a Book

When I agreed to write the back page for *Wired,* I had no idea what it would entail. I encountered many surprises. The biggest by far was my discovery that the magazine readership included a wide range of people, not just those with an @ behind their name. When I learned that kids were giving *Wired* to their parents as Christmas presents, I was blown away. There seems to be a huge thirst to understand computers, electronic content, and the Net as a culture – not just as a technology.

For this reason, and with encouragement from many readers (both rants and raves), I decided to repurpose my *Wired* columns into a book entitled *Being Digital,* which comes out the first of February. The idea sounded simple in June – but 20 stories don't necessarily string together into one book, even if they happen to be pearls. More important, so much has changed so quickly that the future-looking early stories have become old hat.

Consider Germany and Mexico. Less than half of all Germans are under 40; more than half of all Mexicans are under 20. Which of those nations will benefit first from "being digital"?



To my surprise, one thing that held up from the beginning was that the columns used words alone – no pictures. That seemed to work. As one of the inventors of multimedia, I found it ironic that I never use illustration. Furthermore, as a believer in bits, I had to reconcile myself to the idea that my publisher, Knopf, would be shipping mere atoms around.

Bits Are Bits

But I did learn a few things as I mined my columns for the themes that run throughout *Being Digital.* The first is that bits are bits, but all bits are not created equal. The entire economic model of telecommunications – based on charging per minute, per mile, or per bit – is about to fall apart. As human-to-human communications become increasingly asynchronous, time will be meaningless (five hours of music will be delivered to you in less than five seconds). Distance is irrelevant: New York to London is only five miles further than New York to Newark via satellite. Sure, a bit of *Gone with the Wind* cannot be priced the same as a bit of e-mail. In fact, the expression "a bit of something" has new and enormous double meaning.

Furthermore, we are clueless about the ownership of bits. Copyright law will disintegrate. In the United States, copyrights and patents are not even in the same branch of government. Copyright has very little logic: you can hum "Happy Birthday" in public to your heart's delight, but if you sing the words, you owe a royalty. Bits are bits indeed. But what they cost, who owns them, and how we interact with them are all up for grabs.

Interface – Where Bits and People Meet

You cannot experience a bit. It must be turned back into atoms for human beings to enjoy it. While the process of converting bits to atoms has become sensory-rich, the reverse direction – turning atoms into bits – is almost desolate. Human input to machines is Paleolithic and keeps most parents and many of our friends from being wired.

The bottlenecks are speech (long overdue) and vision (normally not considered). What I realized in writing this part of the book is that a happy coincidence is staring us in the face (so to speak). Many companies, notably Intel (which is very vocal about many things), are pushing desktop videoconferencing. The result is that sooner rather than later, we will have a growing population of machines with solid-state television cameras at the top of the screen and built-in microphones at the bottom.

While this design has been conceived to pass your voice and a picture of your face to a remote and similar machine, it could serve handsomely as a direct feed into your computer – not a teleconference but a local conference with your machine. So please, Intel, make sure that audio and video are processable, so my machine sees my face and hears my voice. On occasion, I really do want to be in a society of one.

Digital Life

Here is where my optimism may have gotten in the way; I guess I have too many of those O (for optimistic) genes. But I do believe that being digital is positive. It can flatten organizations, globalize society, decentralize control, and help harmonize people in ways beyond not knowing whether you are a dog. In fact, there is a parallel, which I failed to describe in the book, between open and closed systems and open and closed societies. In the same way that proprietary systems were the downfall of once great companies like Data General, Wang, and Prime, overly hierarchical and status-conscious societies will erode. The nation-state may go away. And the world benefits when people are able to compete with imagination rather than rank.

Furthermore, the digital haves and have-nots will be less concerned with race or wealth and more concerned (if anything) with age. Developing nations will leapfrog the telecommunications infrastructures of the First World and become more wired (and wireless). We once moaned about the demographics of the world. But all of a sudden we must ask ourselves: Considering two countries with roughly the same population, Germany and Mexico, is it really so good that less than half of all Germans are under 40 and so bad that more than half of all Mexicans are under 20? Which of those nations will benefit first from "being digital"?

And You Don't Even Have to Read It

One of the many things I learned is that publishers will release simultaneously an audio version of the book. I discovered this at the same time I learned I was expected to read it. Being dyslexic, even with my own words, I refused. Then I asked Knopf if Penn Jillette (see *Wired*'s September cover) could do it. Penn is one of the coolest people I know, and I felt he would bring all sorts of magic to the process. During the time when I thought Knopf was stewing on this wild idea, they were in fact asking Penn, before I could even get to him. He graciously agreed. All he asked me by e-mail was, "Are there any hard words?" No, there are none. ■ ■ ■

Next Issue: 000 000 111

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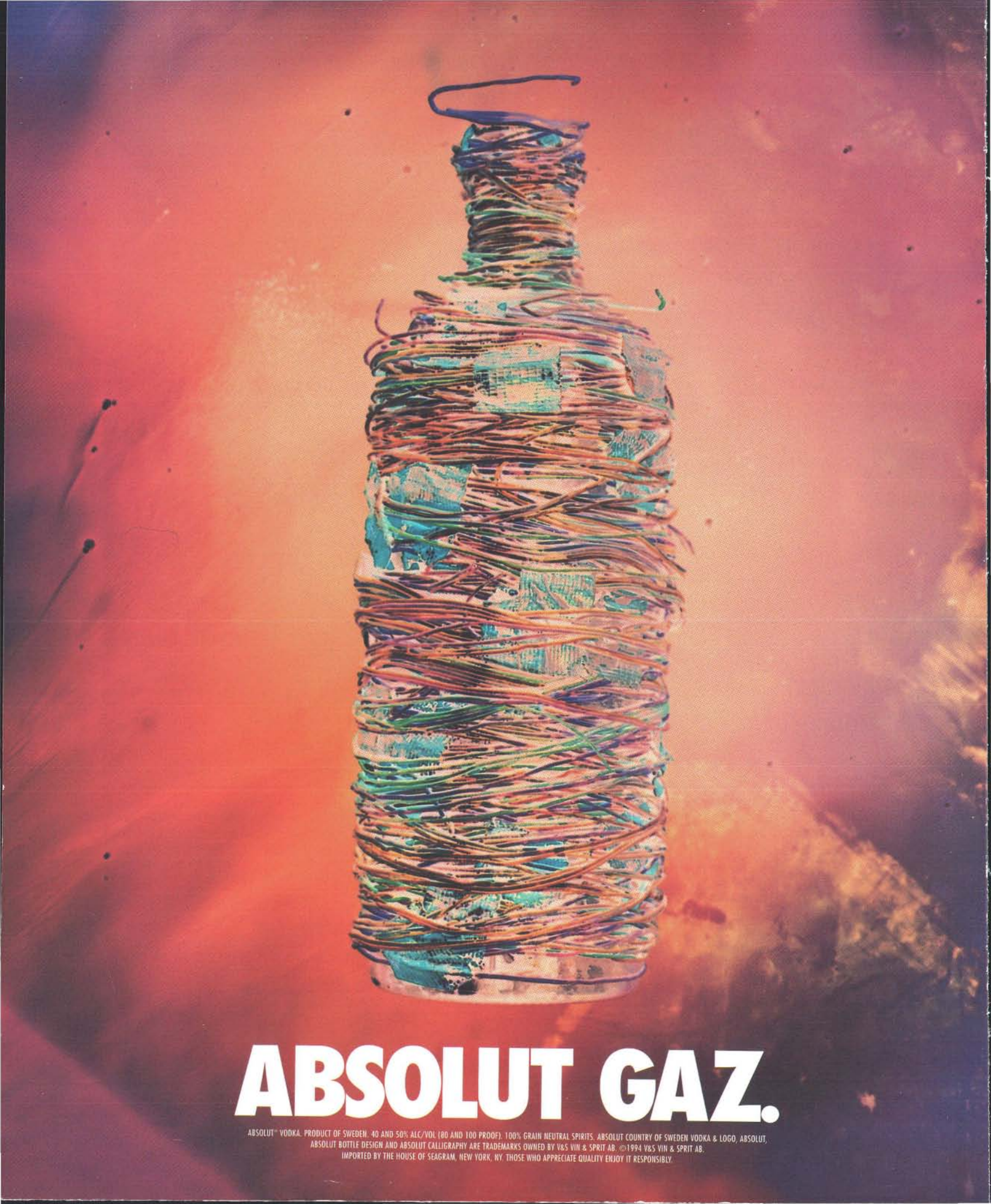
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